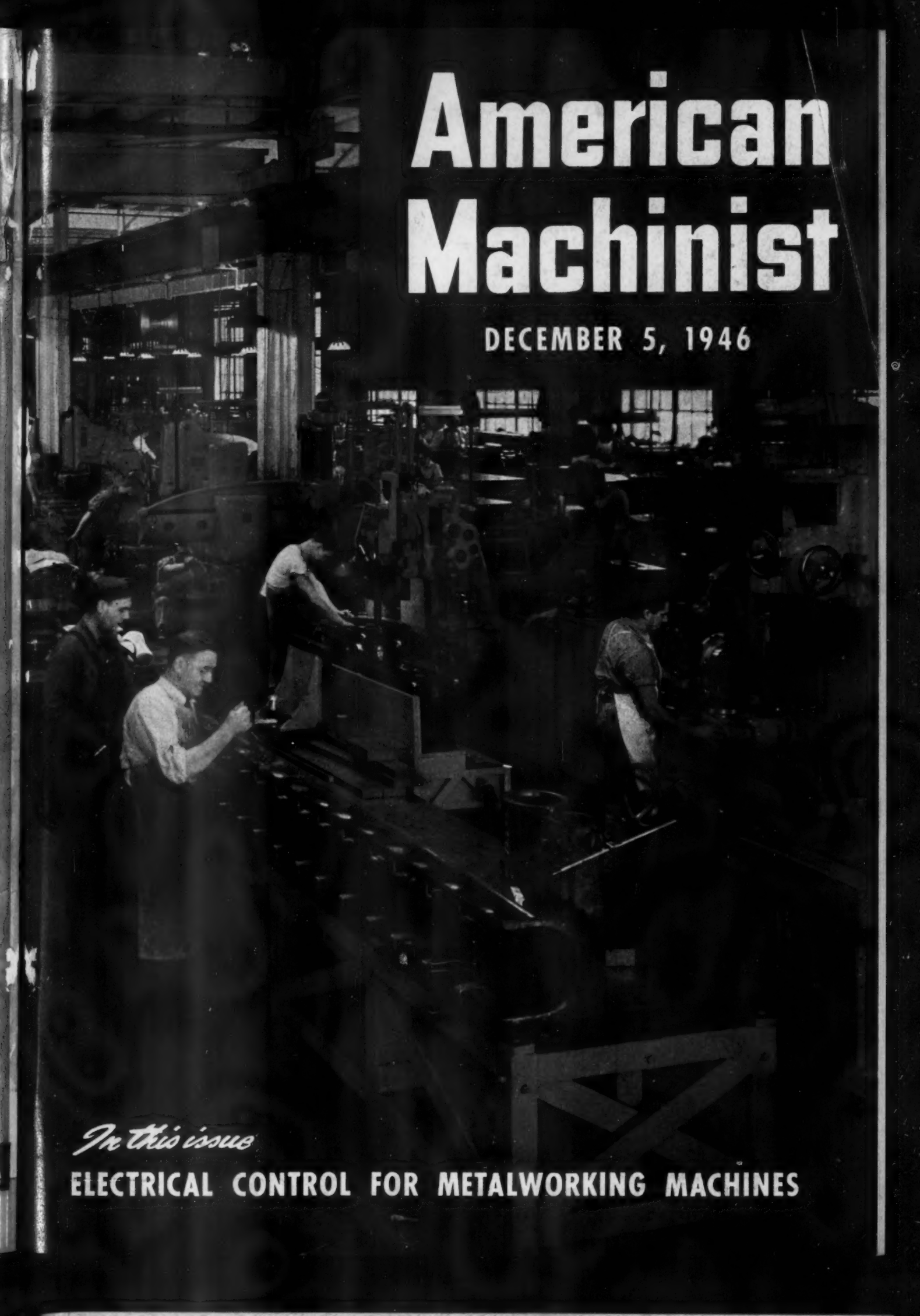

American Machinist

DECEMBER 5, 1946

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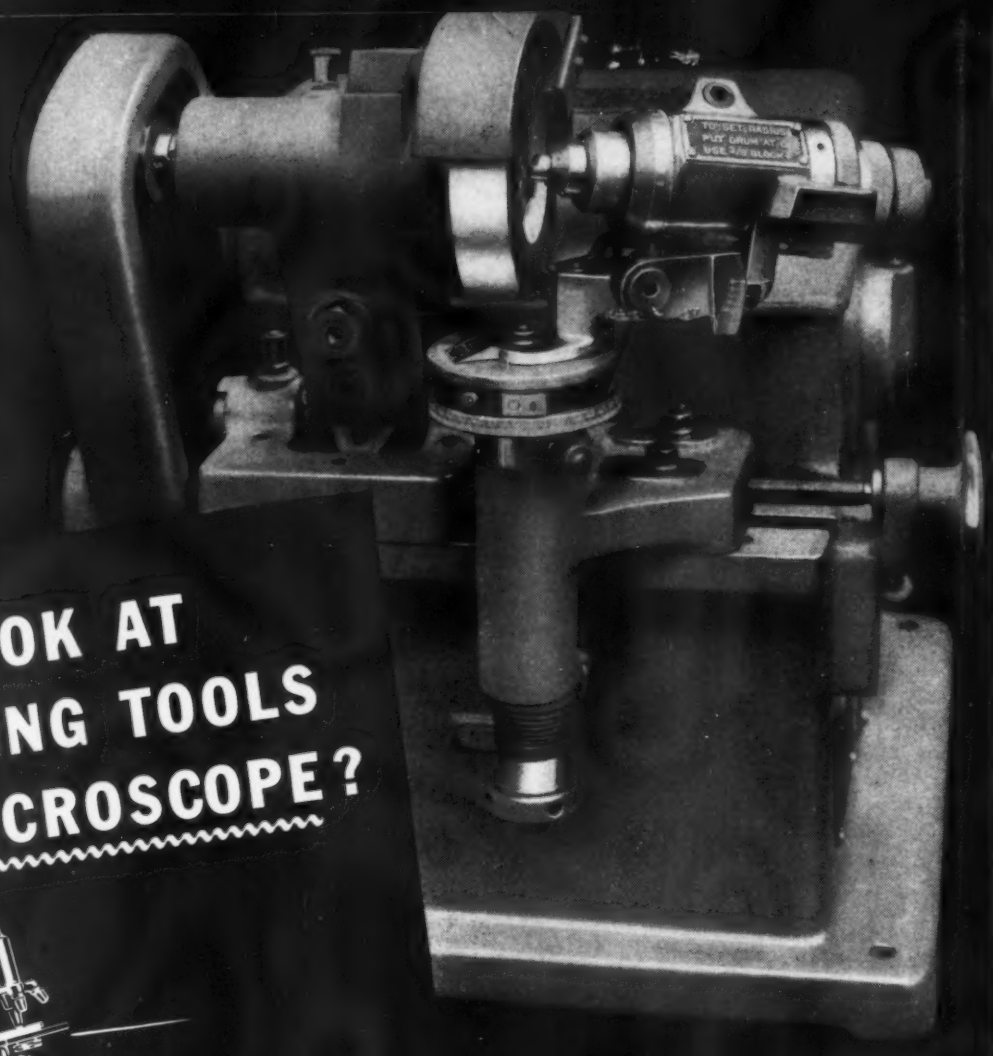

EVER LOOK AT YOUR CUTTING TOOLS UNDER A MICROSCOPE?

WRONG This tool point was ground free hand. Photomicrograph shows a jagged, irregular cutting edge, subject to rapid wear.

RIGHT Automatic lapping on the Heald Tool Sharpener finished this carbide-tipped point with "microscope precision"—left a keen cutting edge.

Here's how the Heald Tool Sharpener gives you "microscope precision"... automatically

IF YOU COULD LOOK at your single-point carbide cutting tools under a microscope, what would you see? Here's the answer, in actual photomicrographs which prove that the *method* of sharpening makes a big difference in the *shape* of your tools . . . and in their effectiveness.

Tools ground by hand—the old-fashioned way—reflect human errors. For even the most expert machinist cannot reproduce exact tool shapes free hand, nor can he grind the carbide tips with perfect regularity.

The Heald Tool Sharpener, on the other hand, requires no special skills. The operator simply adjusts the controls, flicks a switch, and the tool is diamond lapped, automatically, on its radius and five different angles—all in a single setting of machine. Result: a smooth, regular cut edge, finished with "microscope precisi

Yet the Heald Tool Sharpener m more than a microscopic difference in production schedule. Correct lapping creases the life of your cemented car tools . . . lowers maintenance costs helps you to get greater accuracy in cision finishing work. For further infor tion, write: THE HEALD MACHINE COMP Worcester 6, Mass.

HEALD

means more precision . . . less cost

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American Machinist

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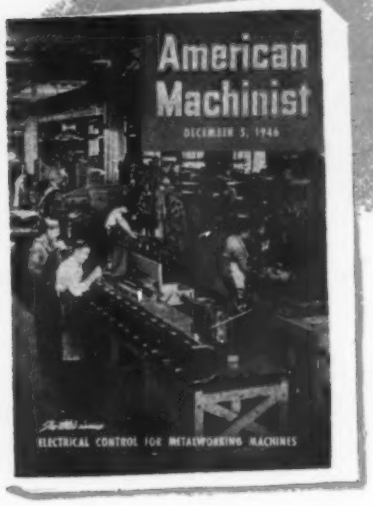


Chips and QUIPS

Cover Picture . . . A portion of the toolroom main bay at Vulcan Tool Co., Dayton, Ohio. Tools are grouped for efficiency, spaced and arranged to permit assembly of products in an area to left of this Kodachrome. Obviously Vulcan is "color-minded" (see "Color in the Shop," *A. M.*, May 9) as reported by Lee W. Jones, vice president. He reports they did the entire toolroom in 1940-41, since then do not turn on power on new machine tools until they are in the plant color scheme.

Pushbutton Control . . Have you ever wondered what's between the pushbuttons and the tools on metalworking machines? A short course in electrical control is presented as our special report in this issue. As usual, it's the result of extensive travel and digesting of resulting data by Assistant Editor Van Voast. In it also he has applied some of the visual-education methods he applied in teaching sailors.

Featherweight . . . Brooks & Perkins, Detroit, are making a 12-lb. "Lawnbarrow" of magnesium alloy. (The idea is to carry the load only one way.) Some tricky fabricating problems were involved; they and their solution are described complete with Ricker sketches.

Also . . . Providing more of the data you've requested, we have detailed instructions on buffing plastics from Lea . . . Safety suggestions for power saws and bar stockrooms . . . Part II on Glenwood Wheel Shop . . . Flash-welding stainless, conclusion of the series (see right) . . . Usual departments.

Please Return To . . . A miniature (four pages) report on low-alloy high-strength steels also appears in this issue, for a total of 25 in the 26 issues of the past year. It was to be an 8-page job, but Associate Editor Wharen found he could get available information into half the space. He sent out copies for approval to major steel companies—and couldn't get the table back. The engineers insisted on keeping the copies for their own use. Wharen's puffed like a pouter pigeon.

Bucks Passing . . . N. L. Chen, sent by the Chinese Government to study tool design by working at Pratt & Whitney Aircraft, recently wrote us in fear and trembling—he'd neglected to put his company connection on catalog requests. We sent him new blanks to fill out—catalogs are hard to come by in these days of shortages, so manufacturers rarely honor unidentified requests. We also forwarded his requested copy of our decimal chart—the grandpa (acknowledged or not) of those you see everywhere. His thanks were unique—four crisp souvenir Chinese banknotes totalling $511.10 yuan. A trip to China would be in order.

Coming . . . For your Christmas presents (in our issue of Dec. 19) please accept the following: How to Use Diamonds to Cut Plastics, Tricky Welding Setups, A Profit-sharing Plan, Feed and Takeoff Devices on Presses at Fisher Body, Mold Steels, Carbide Ball Burnishing . . . topped off by a 12-page special report on "Merit Rating."

Sales Formula . . A sales executive gives these requirements for a salesman: "A good salesman, in addition to being a creative thinker, must have the curiosity of a cat, the tenacity of a bulldog, the determination of a cab driver, the diplomacy of a wayward husband, the patience of a mother, the friendliness of a child, the enthusiasm of a chorus girl, the simplicity of a jackass, the assurance of a sophomore and the persistence of a bill collector."

"I scan each and every page of American Machinist *immediately upon receipt of same. Many times I try to apply equipment advertised and illustrated." Henry H. A. Roehm, Tl. Des. Supv., Wright Aeronautical, Paterson, N. J.*

PRIZE WINNER . . . Joseph J. Riley is the author of the 3-part series on resistance-welding of stainless steel: spot and projection (Nov. 7), seam (Nov. 21) and flash (this issue), backed by four years of work on resistance-welding problems in the welding laboratory of the Taylor-Winfield Corporation. He has written several papers on his results, one, "Variation in Quality of Spot Welds in Carbon Steel Over a Range of Welding Variables," being a prize winner in the recent contest of the Resistance Welder Manufacturers Association.

Mr. Riley was graduated with a B.S.E.E. from Massachusetts Tech. in 1939. After several years in the experimental laboratory at Delco Products, Division of General Motors Corporation, he moved to Taylor-Winfield. His present assignment is in sales engineering.

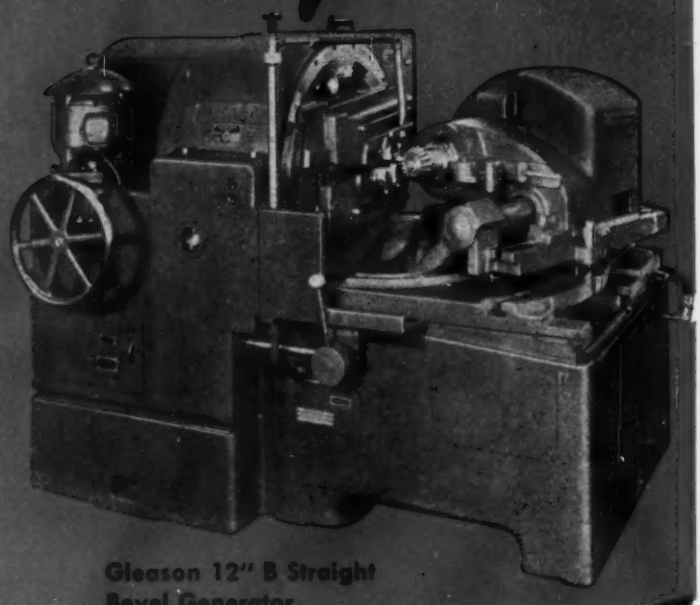
Why Use Coniflex Gears?

Coniflex gears are superior to ordinary straight bevels . . . they are the gears with localized tooth bearing . . . produced on the latest Gleason straight bevel generators in the medium and large sizes by means of a positive cam-controlled advance of the tool slides at each end of the cutting stroke.

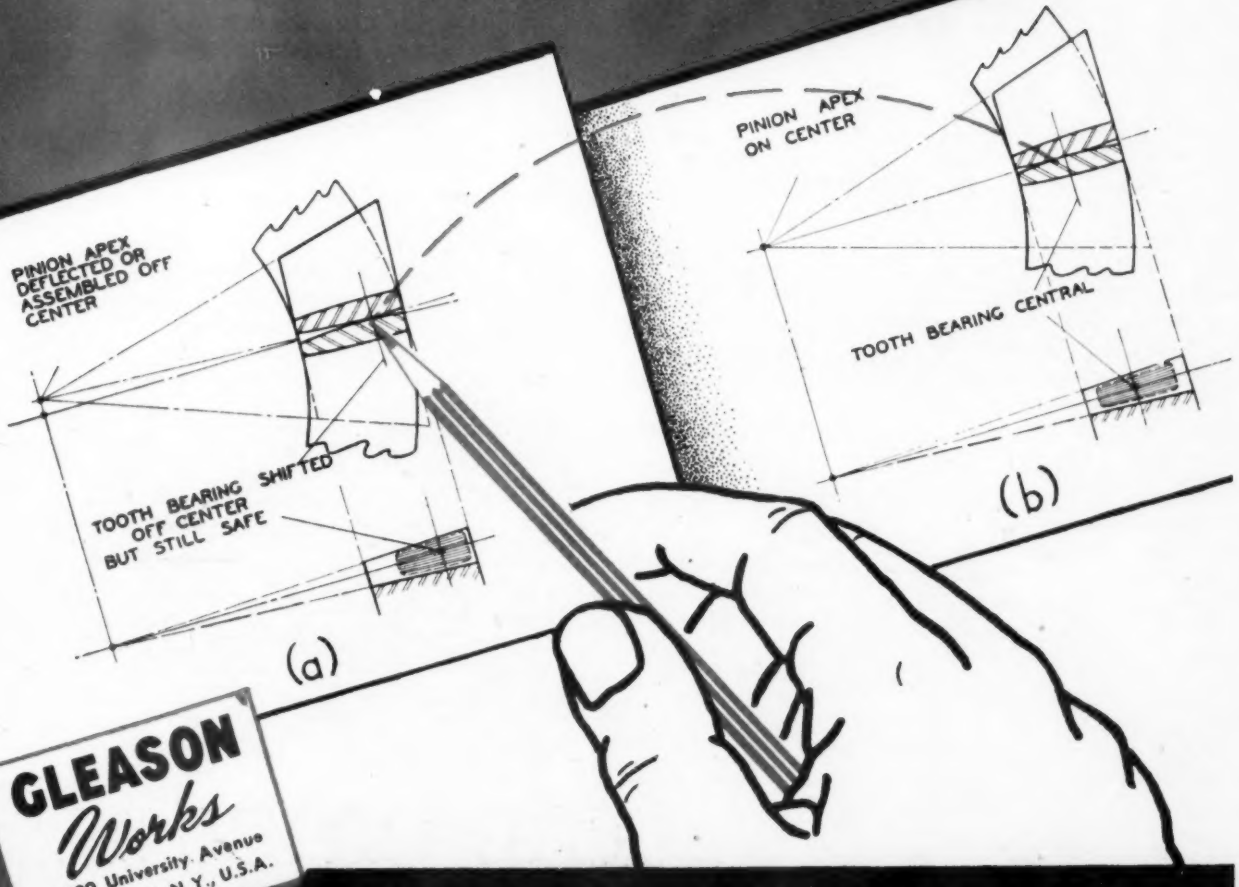
Why are they preferred? . . . because the ends of the teeth are relieved, allowing for slight deflections in operation without dangerous concentration of the loads at the ends of the teeth. This also makes assembling simpler and provides a definite bearing for smoother, quieter operation.

The usual operating position (b) for generated straight bevel gears is with the bearing centrally located.

The same gears (a) when displaced still operate smoothly without dangerous concentration on the ends of the teeth.



Gleason 12" B Straight Bevel Generator


PINION APEX DEFLECTED OR ASSEMBLED OFF CENTER
TOOTH BEARING SHIFTED OFF CENTER BUT STILL SAFE
(a)
PINION APEX ON CENTER
TOOTH BEARING CENTRAL
(b)

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Builders of Bevel Gear Machinery for Over Eighty Years

WITH THESE ATTACHMENTS YOU CAN ASSIGN MORE JOBS

Here a High Speed Universal Milling Attachment, supported by an individual crane, is mounted on a CINCINNATI No. 2 MI Miller.

to your Cincinnati Millers!

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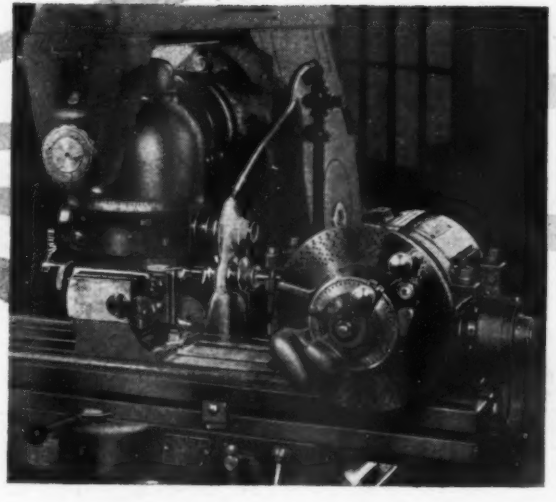
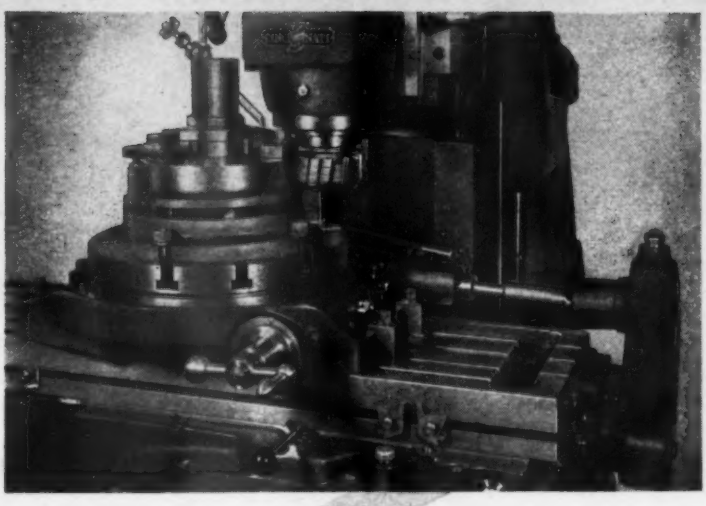


Universal Spiral Milling Attachment and Dividing Head equipped with Wide Range Divider. These attachments have an exceptionally wide range of uses.

THE CINCINNATI

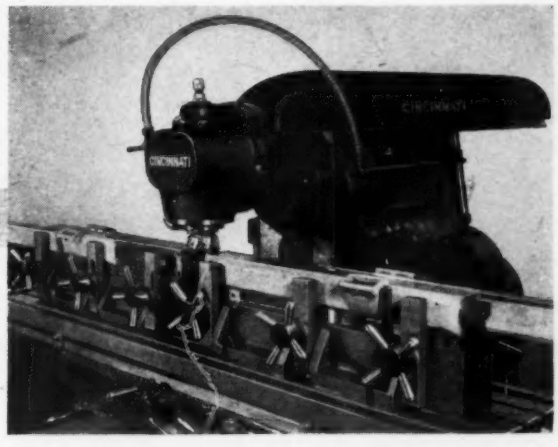
MILLING MACHINES



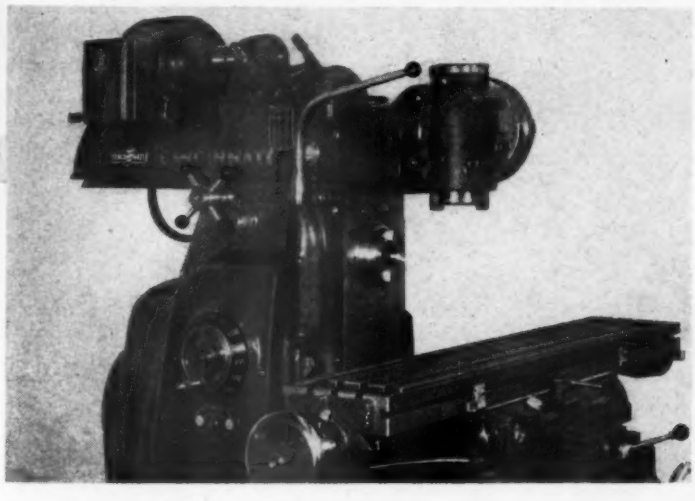
Left: Circular Milling Attachment with power feed drive. For circular milling operations. May also be tooled up for continuous milling. 16", 20" and 24" sizes available.

Above: Milling a fixture part held in a No. 5 Plain Vise. Vise jaws may readily be changed to special designs suitable for the work. Swivel, Toolmaker, and All-Steel Vises also available.

● Here are six of the thirty-five different standard milling attachments offered by CINCINNATI to simplify tooling; improve methods; handle a different type of operation; raise quality; lower unit costs; step up production; minimize equipment costs. Attachments may be purchased with machines or as an afterthought—i.e., most of them are not "built-in," but may be obtained as the need arises. ¶ All types and styles of CINCINNATI Milling Attachments are illustrated and described briefly in attachment circular M-1382-1. Write for your copy.



Above: Heavy Vertical Milling Attachment. Does the work of a vertical machine. Spindle head may be swiveled 45° right and left.



Left: Motor Driven Universal Milling Overarm Attachment on a CINCINNATI No. 2 MI; for milling bevels, flats and angles. Always ready to use; convenient for frequent changes in setups.

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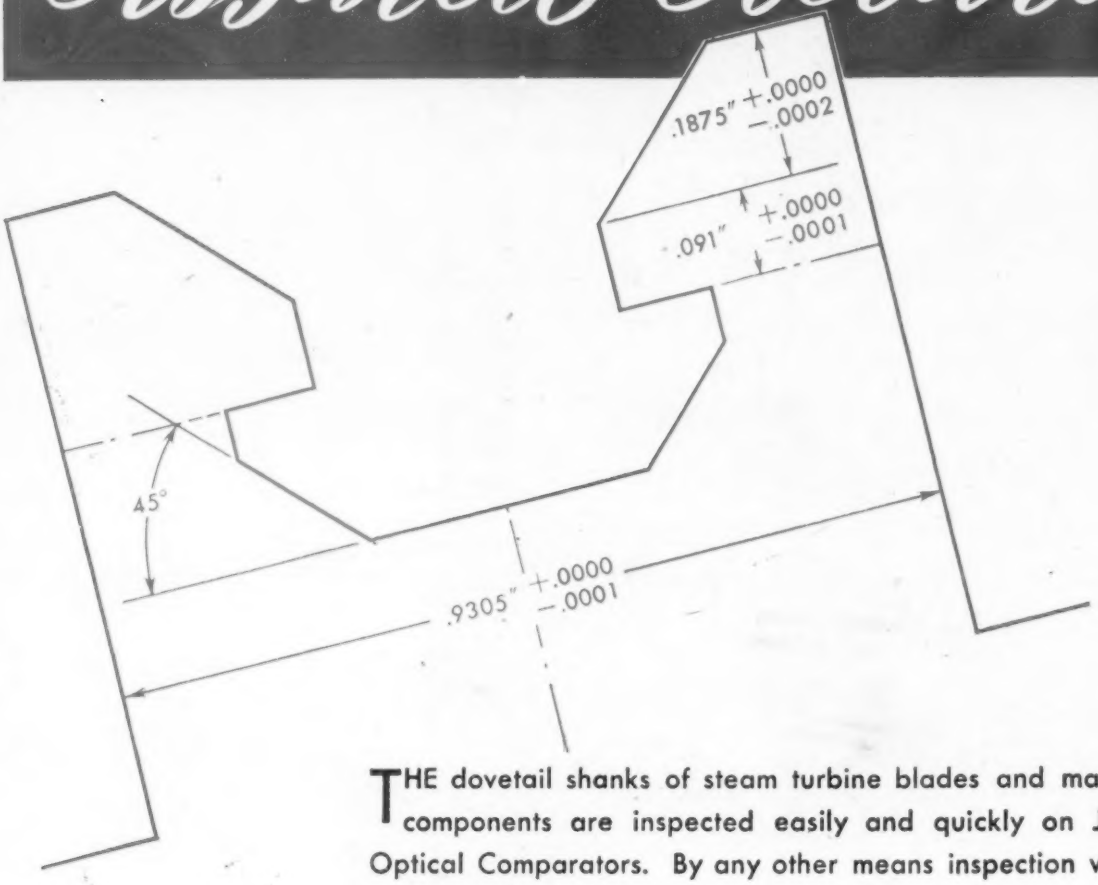

THE dovetail shanks of steam turbine blades and many other turbine components are inspected easily and quickly on Jones & Lamson Optical Comparators. By any other means inspection would be a slow and costly process.

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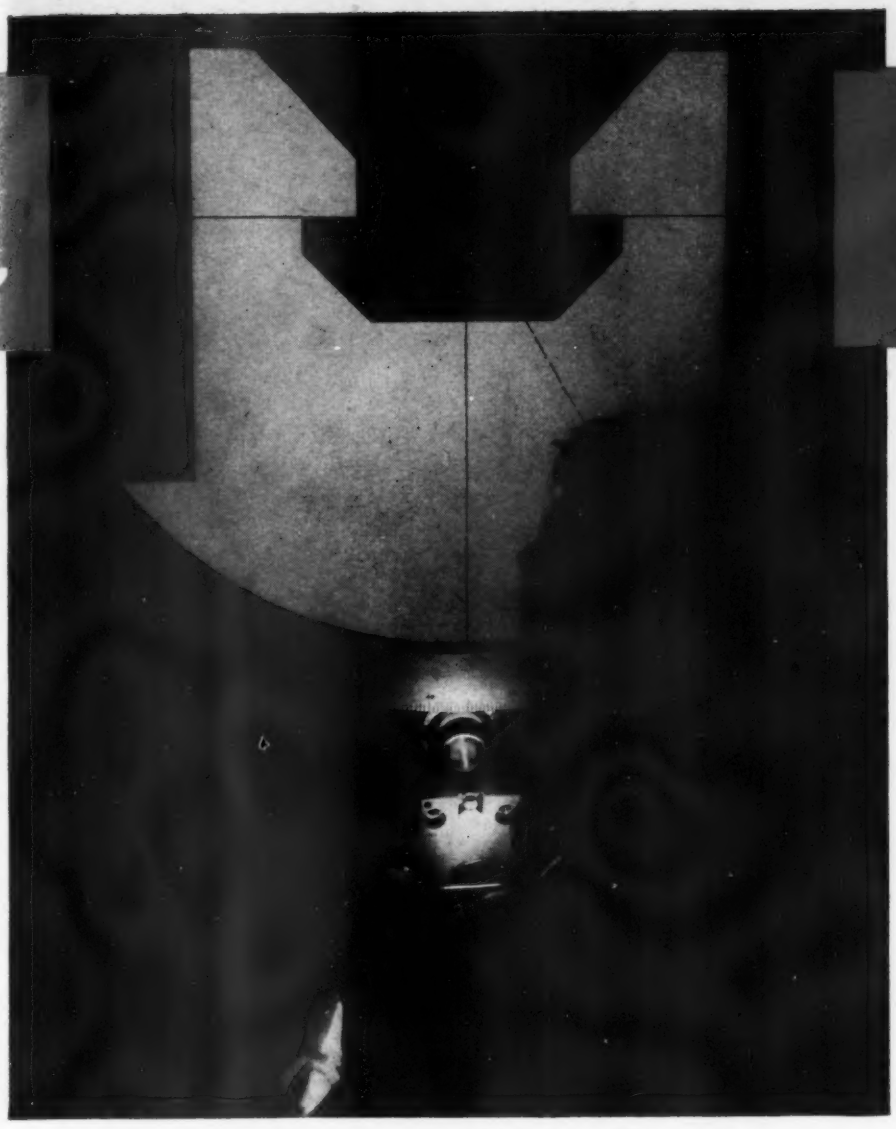
Probably a Jones & Lamson Optical Comparator could effect comparable savings for you. Write for our book, "Beyond a Shadow of a Doubt." Or, better still, ask for one of our inspection engineers to call and discuss your inspection problems.



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Courtesy The Elliott Company,
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STANDARD PEDESTAL COMPARATOR
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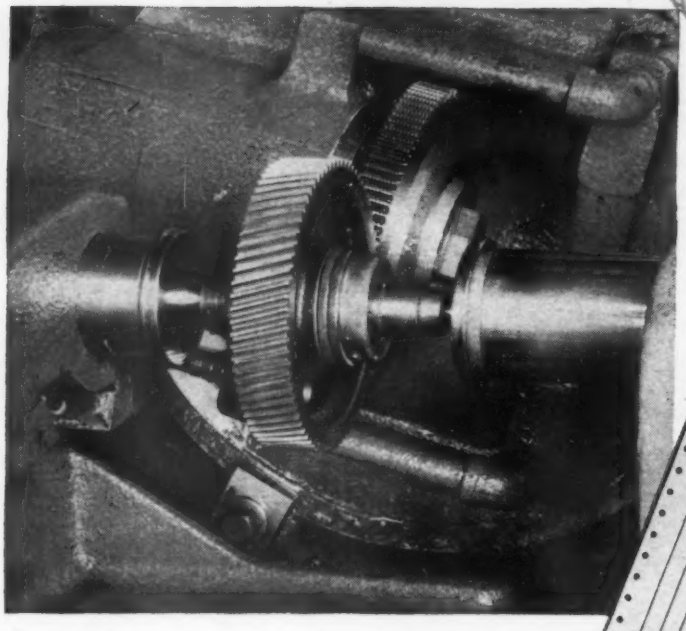
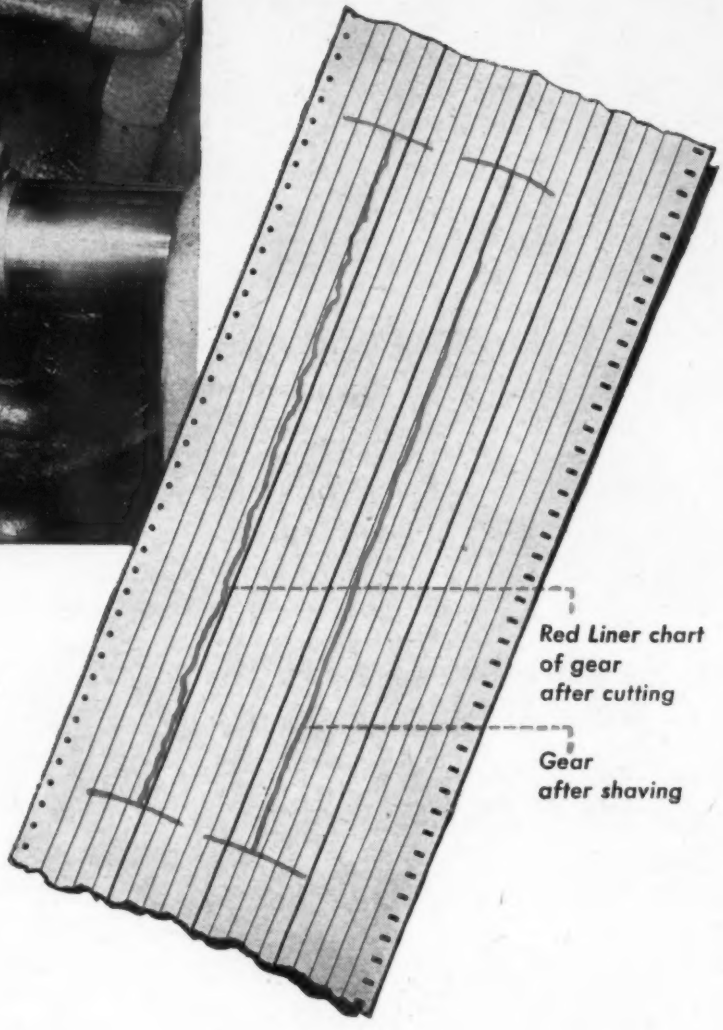
Shaved GEAR PRECISION IN





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- **by...ultra precise control of shaft and spindle speeds**
- **by...capacity for higher operating speeds throughout**
- **by...velvety smoothness and longer wear**
- **by...vastly improved quiet...for the working comfort of mill operatives**

● **GOVERNMENT SURPLUS MACHINE TOOLS:** We are licensed under the WAR ASSETS ADMINISTRATION to act as dealers in the disposal of Government Surplus Machinery. Those interested in obtaining such machinery should contact our Main Office, Springfield, Vt.; or our offices in Detroit, Mich., and Chicago, Ill.

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Fellows Gear Shaving solves problem of producing precision gears for Nylon Textile Machines

Absolute size uniformity of nylon thread and other man-made fibers demands textile equipment of a new order...re-designed to incorporate higher speeds and dependable precision of functioning.

The related motions of various machine elements must be held to closer tolerances in relative speeds. Lighter machine parts, faster action is the order of the day. Gears that were adequate in pre-war manufacture cannot measure up to the operating requirements of later equipment.

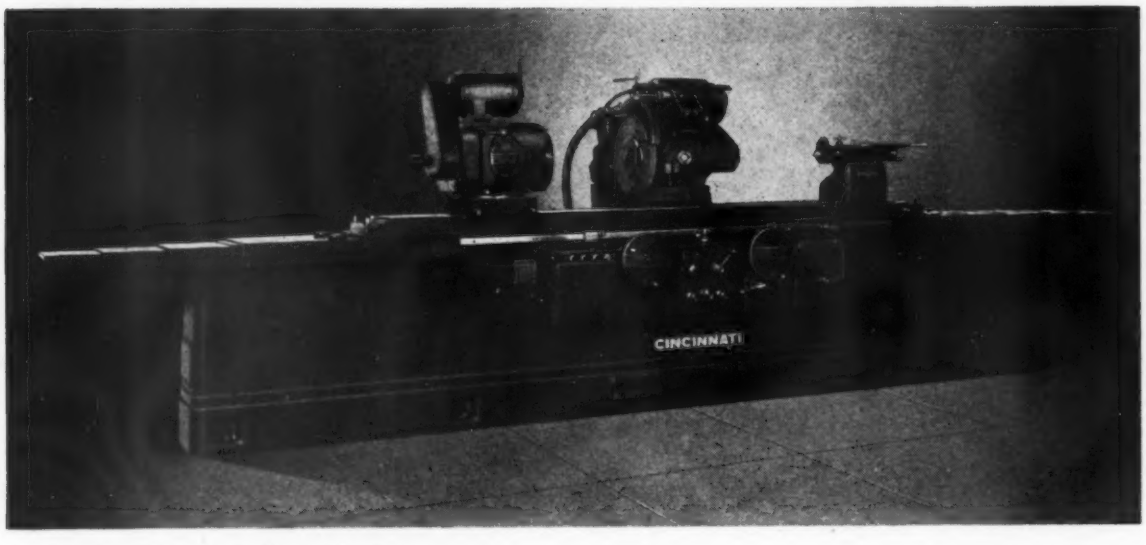
Precision-cut gears had to take over, and, for a growing category of uses, shaved-gear accuracy is demanded. High speeds and quieter operation are everywhere in demand, necessitating higher gear quality for which the Fellows Method stands sponsor. Textile machine designers and production men will find much of interest in our 64 page book "The Fellows Method". Write: The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Bldg., Detroit—or 640 West Town Office Bldg., Chicago.

Fellows

ALL OPERATIONS FROM BLANK TO FINISHED GEAR

YOU'LL FIND VERSATILITY *here, too*

FILMATIC Spindle Bearings. The segments are self-adjusting for any rate of stock removal. Approaching to size, you can grind rapidly, then take off barely a whisper for final finish and sizing, with no worry about the bearings overheating, seizing, or wavering.



CINCINNATI FILMATIC 16″ x 72″ Hydraulic Universal Grinder. These machines are available in 12″, 14″, 16″ and 18″ swings; and 36″, 48″ and 72″ between-center lengths. Write for catalog G-486-3 for the 12″ machine, and G-474-3 for the larger sizes.

CINCINNATI

CENTER TYPE GRINDING MACHINES

An external job. Grinding the taper, 3½" per foot, on the shank end of attachment driving gear.

CINCINNATI

An external job. Grinding several diameters of a hardened shaft. Two-speed cross feed control and .0001" increment of hand cross adjustment save time in grinding multiple diameter work.

An internal job. Grinding the bore in a short shaft to an accurate plug gage fit.

A face grinding job. Here the machine is grinding a circular knife for a slicing machine.

● You can assign an unusually wide variety of work to CINCINNATI FILMATIC Hydraulic Universals . . . straight cylindrical, bevel, taper, multiple diameter, face, internal. And with all this versatility in kinds of grinding operations, you'll find equal versatility in the FILMATIC Grinding Wheel Spindle Bearings. They're always ready for any work you might assign to the machine, from a fine finish grind of a few micro-inches to a heavy roughing grind up to the capacity of the grinding wheel drive motor. And with no readjustment or worry whatever about the bearings!

¶ Be sure the next grinding machine you buy—Centerless or Centertype—Plain or Universal—is a CINCINNATI FILMATIC, for they are the only grinders of which this can be said: "No down time has ever been charged against the grinding wheel spindle bearings." The complete FILMATIC story may be obtained by writing for publication No. G-446.

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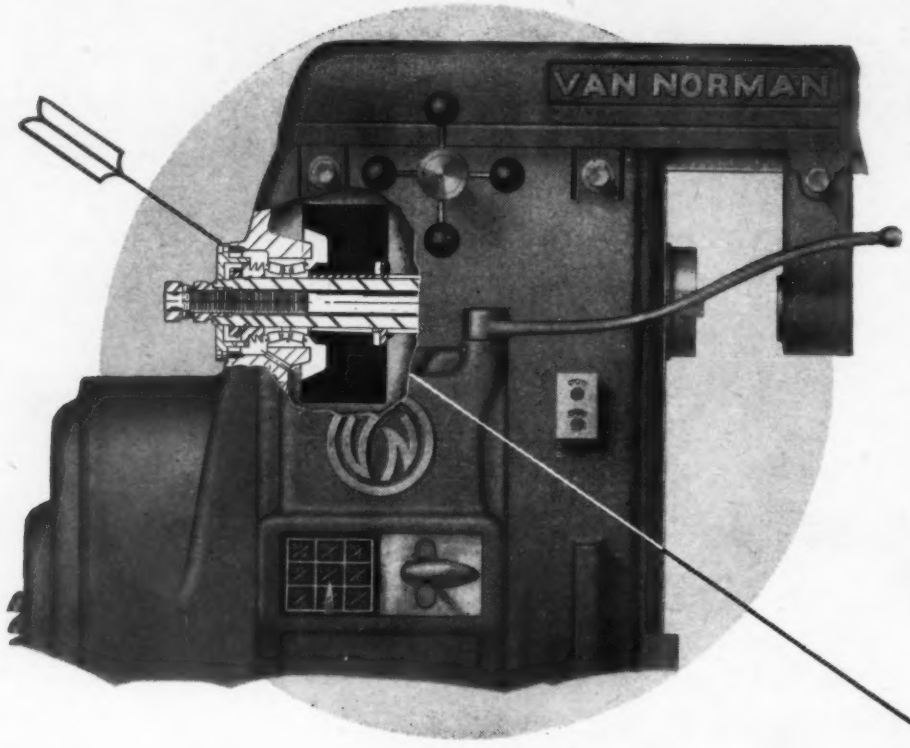

Built-in Flywheel

INCREASES CUTABILITY OF NEW

VAN NORMAN

No. 2 Medium

HORIZONTAL MILLER

Table: 50"x10"— Motor: 5 HP

Among the outstanding design features of the *new* Van Norman No. 2 Medium is the heavy *built-in* spindle flywheel . . . an exclusive Van Norman advantage. Mounted on the spindle inside the column, it provides smooth transmission of power to the cutter. It improves cutability and assures a smooth finish on the work. In addition, the flywheel increases the work range of the miller by enabling operators to handle a larger variety of work.

The No. 2 medium has front and rear directional control of all power feeds, as well as six-way rapid traverse. This permits operators to operate the machine from either position. It assures maximum safety and increases operator output by minimizing fatigue.

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The new Van Norman No. 2 medium is available with plain or universal saddle. Write for complete information today.

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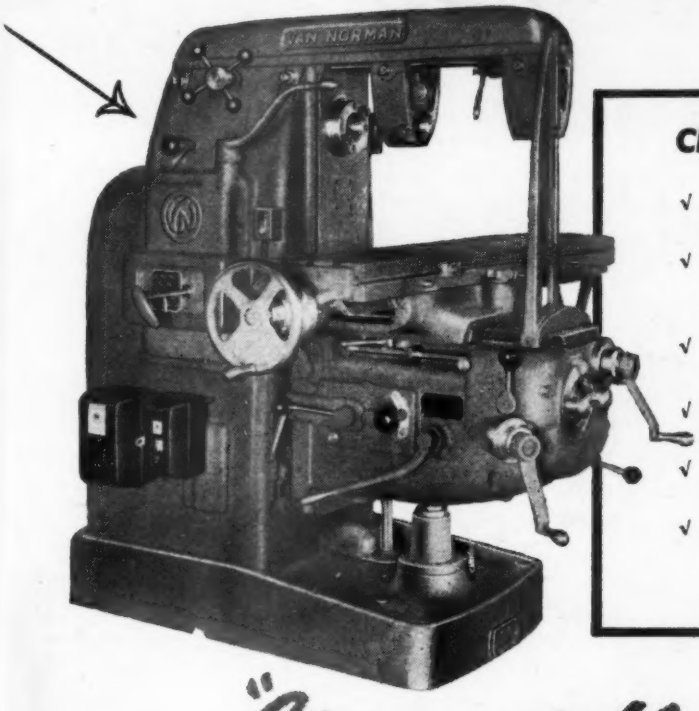
SPRINGFIELD 7, MASSACHUSETTS

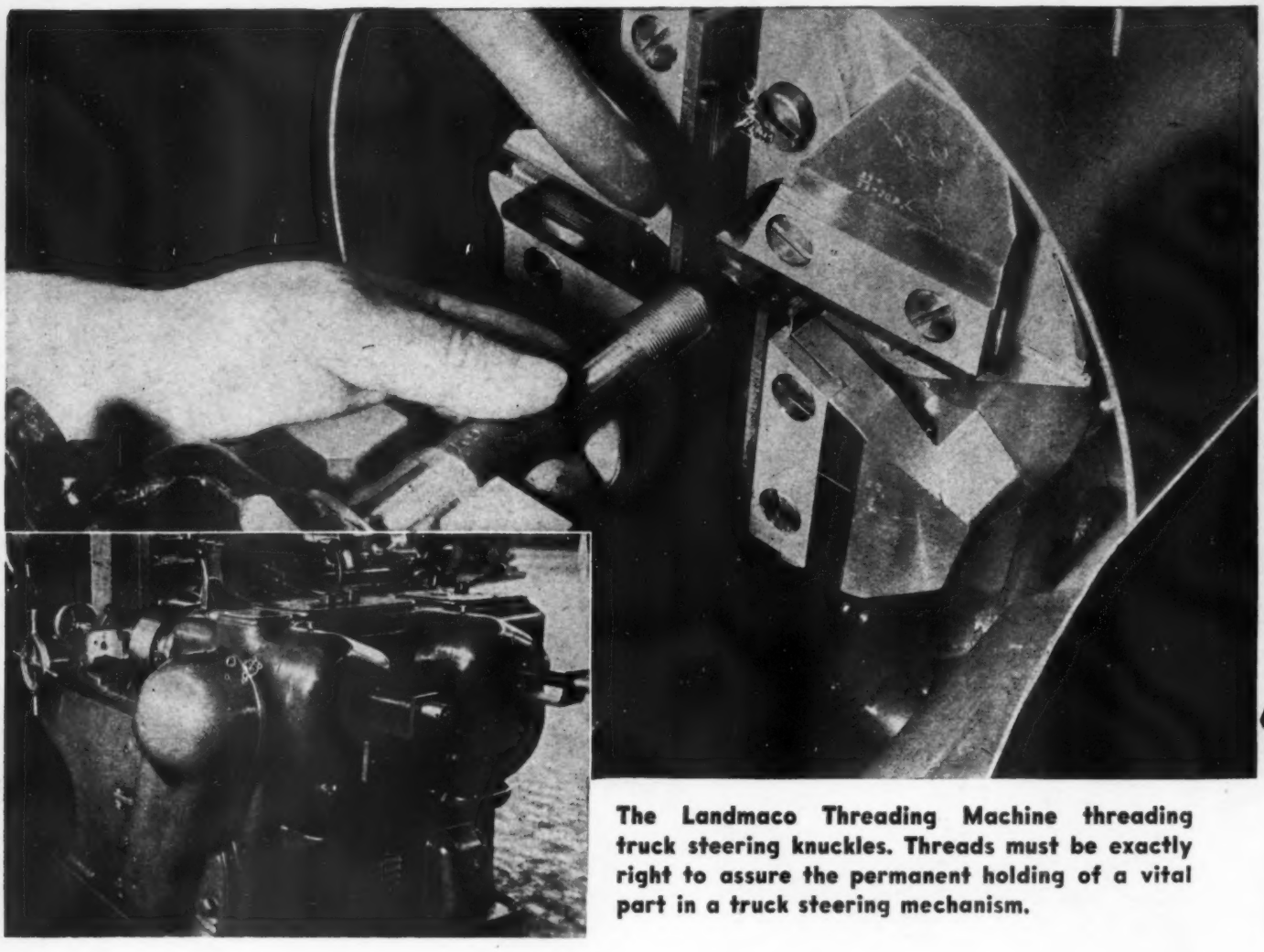


Check These Plus Advantages

- √ Built-in spindle flywheel
- √ Front and rear directional power controls
- √ New heavy column and base
- √ Single lever speed selector
- √ Large diameter cutter spindle
- √ Overarm pilot wheel
- √ Large easy-to-read dials
- √ Heavy ram-type overarm
- √ Automatic lubrication
- √ Hardened alloy steel gears with large tooth area
- √ Six-way rapid traverse

"It pays to Van Normanize"

For Precision Threading the Automotive



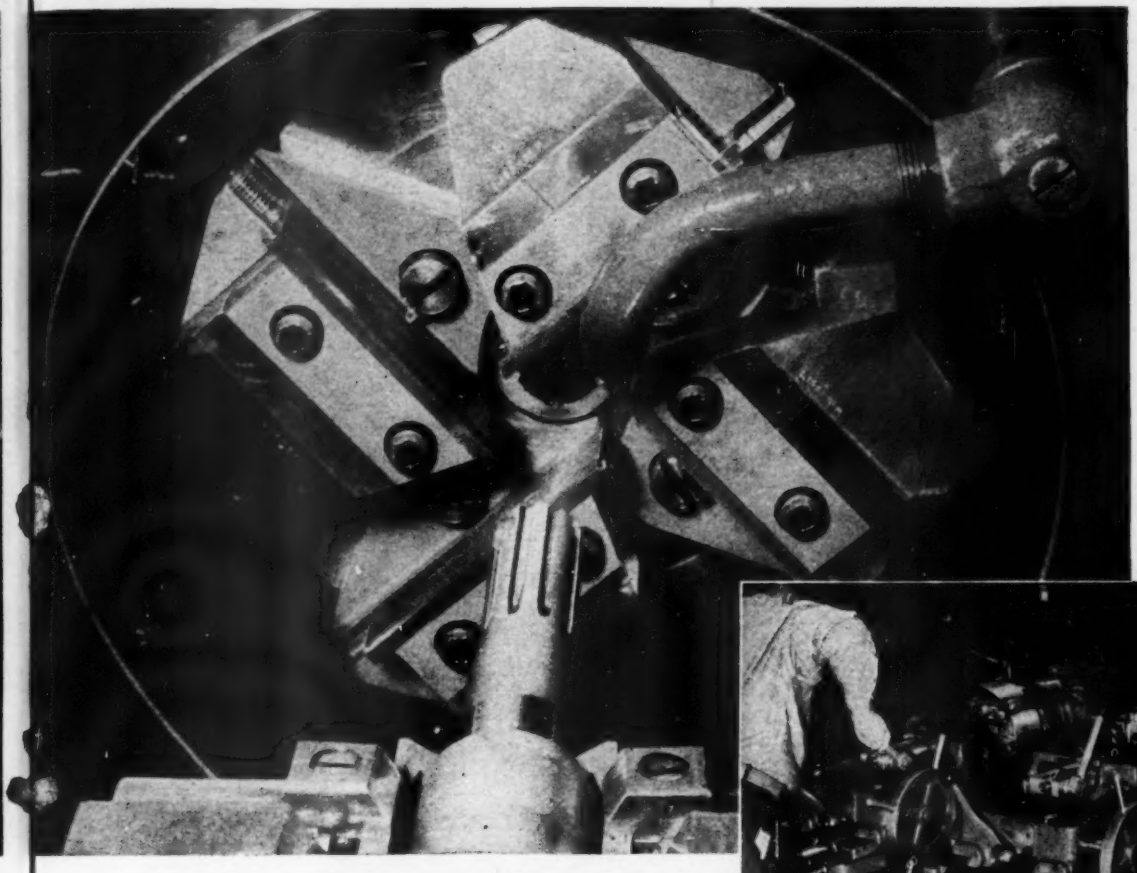
The Landmaco Threading Machine threading truck steering knuckles. Threads must be exactly right to assure the permanent holding of a vital part in a truck steering mechanism.

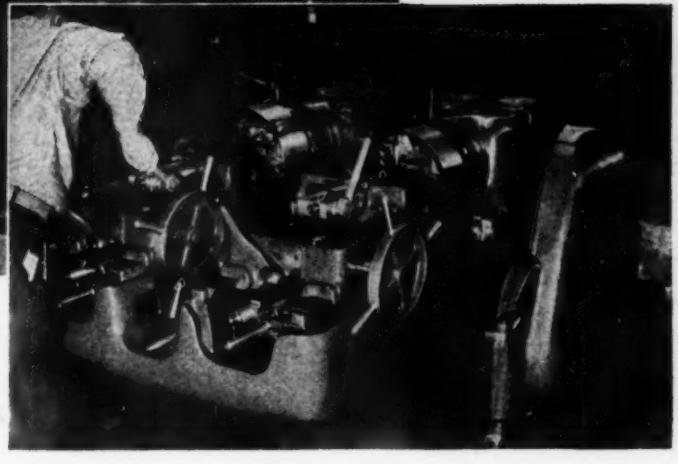
LANDIS THREADING MACHINES are used extensively in automotive plants. Accuracy is of prime importance. Threads must meet the most rigid requirements and must conform exactly to specifications. Besides accuracy, other features are—economy, ease of operation and high productivity with resultant low cost.

LANDIS MACHINE COMPANY

WAYNESBORO · PENNA · U·S·A·

at Low Cost - - -
Industry Chooses LANDIS



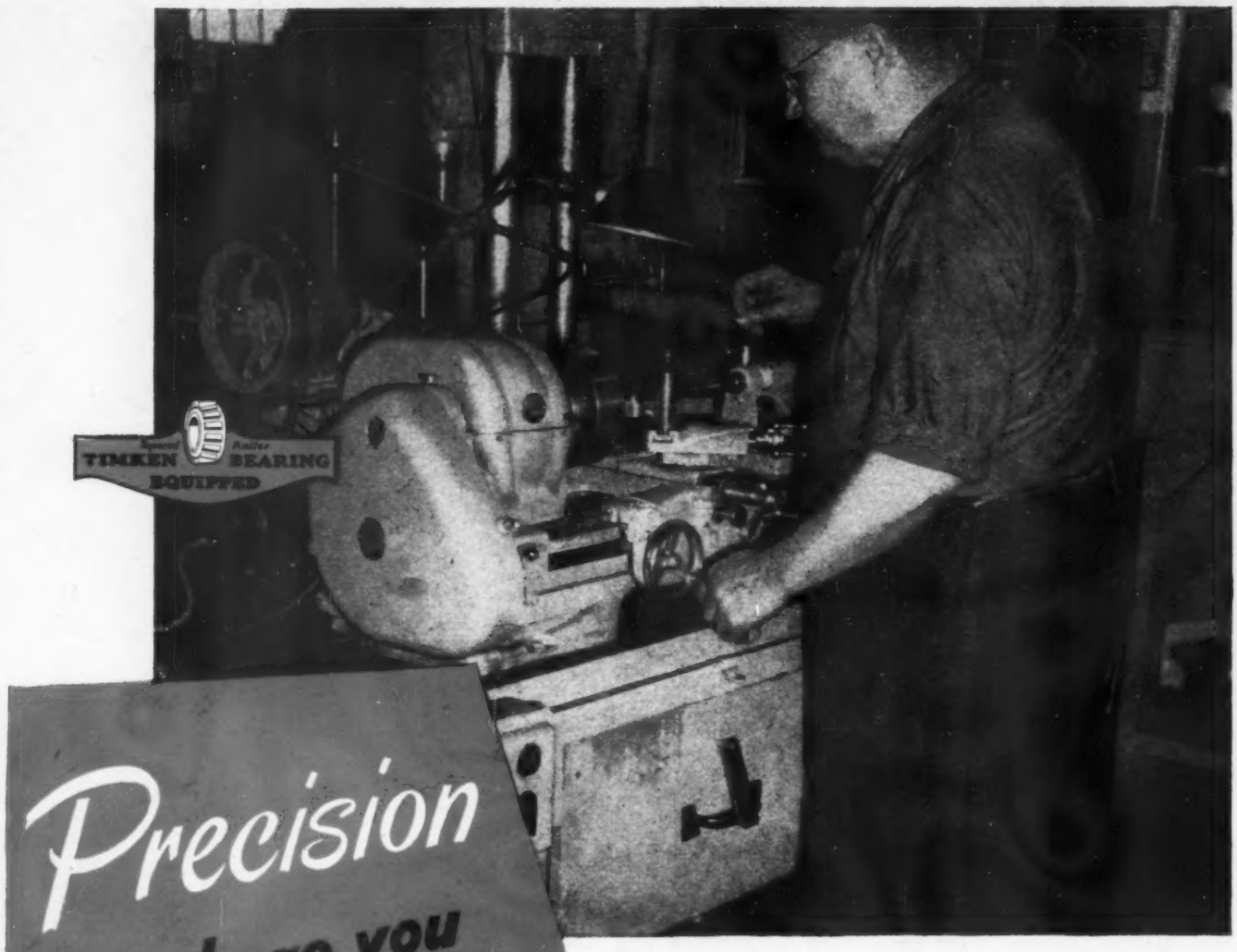


The Landmaco Threading Machine threading spiral hypoid drive pinions. These pinions must be precisely made for perfect assembly, as, once assembled, they are never expected to require attention.

The widespread use of Landis Threading Equipment throughout the automotive industry—where threads must be held to closest tolerances—is just another proof that thread production throughout all metal industries can be safely and economically handled by Landis Threading Machines and Die Heads.

THREAD CUTTING MACHINES · PRECISION THREAD GRINDERS

THREAD CUTTING DIE HEADS · COLLAPSIBLE AND ADJUSTABLE TAPS



Precision is where you find it . .

Precision knows no limitations of size; plays no favorites. You'll find it in all kinds of spindle-operated machines equipped with Timken Tapered Roller Bearings — from the smallest to the largest.

It is a dominant quality in Atlas Bench Lathes, one of which, an Atlas F-Series machine, is shown in the photograph. This is one of a number of Atlas Lathes equipped with Timken Bearings on the spindles, installed in a modern airplane plant.

Your machines need the multiple advantages of Timken Bearings to assure rigid spindles, free from chatter under all speeds, feeds and cutting loads within the capacity of the equipment.

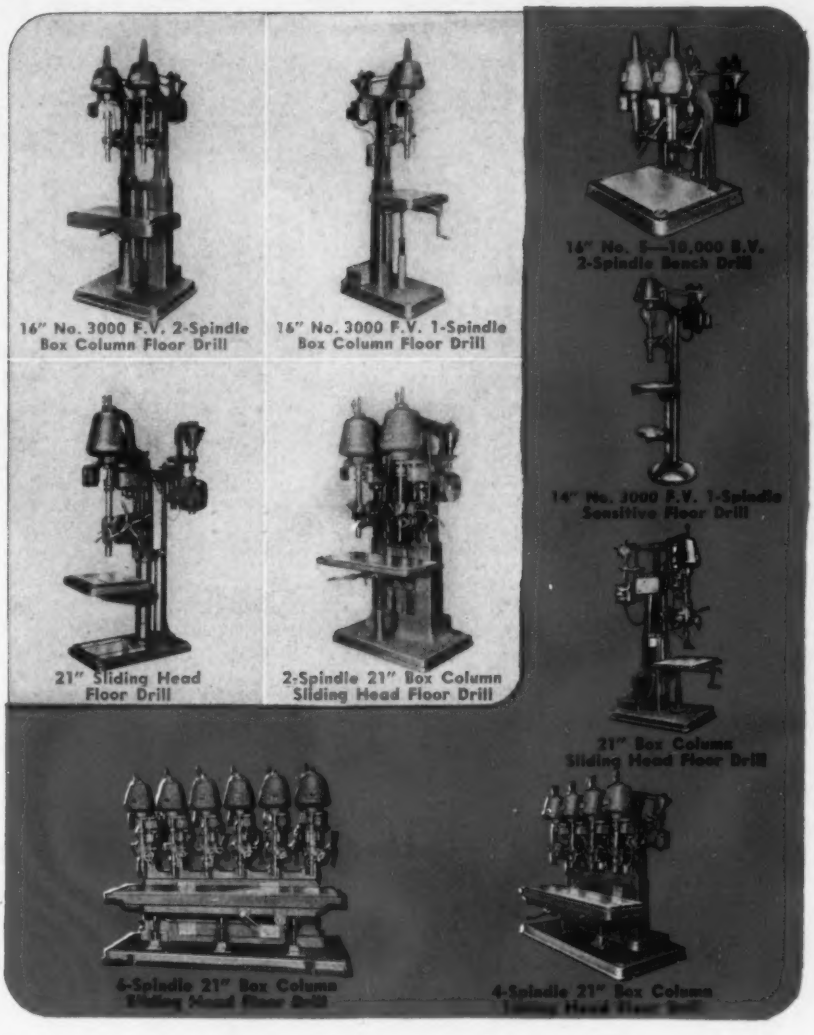
To be sure of getting them look for the trade-mark "TIMKEN" on every bearing you use. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

DRILL PRESSES by Canedy-OTTO

THE WORLD OVER

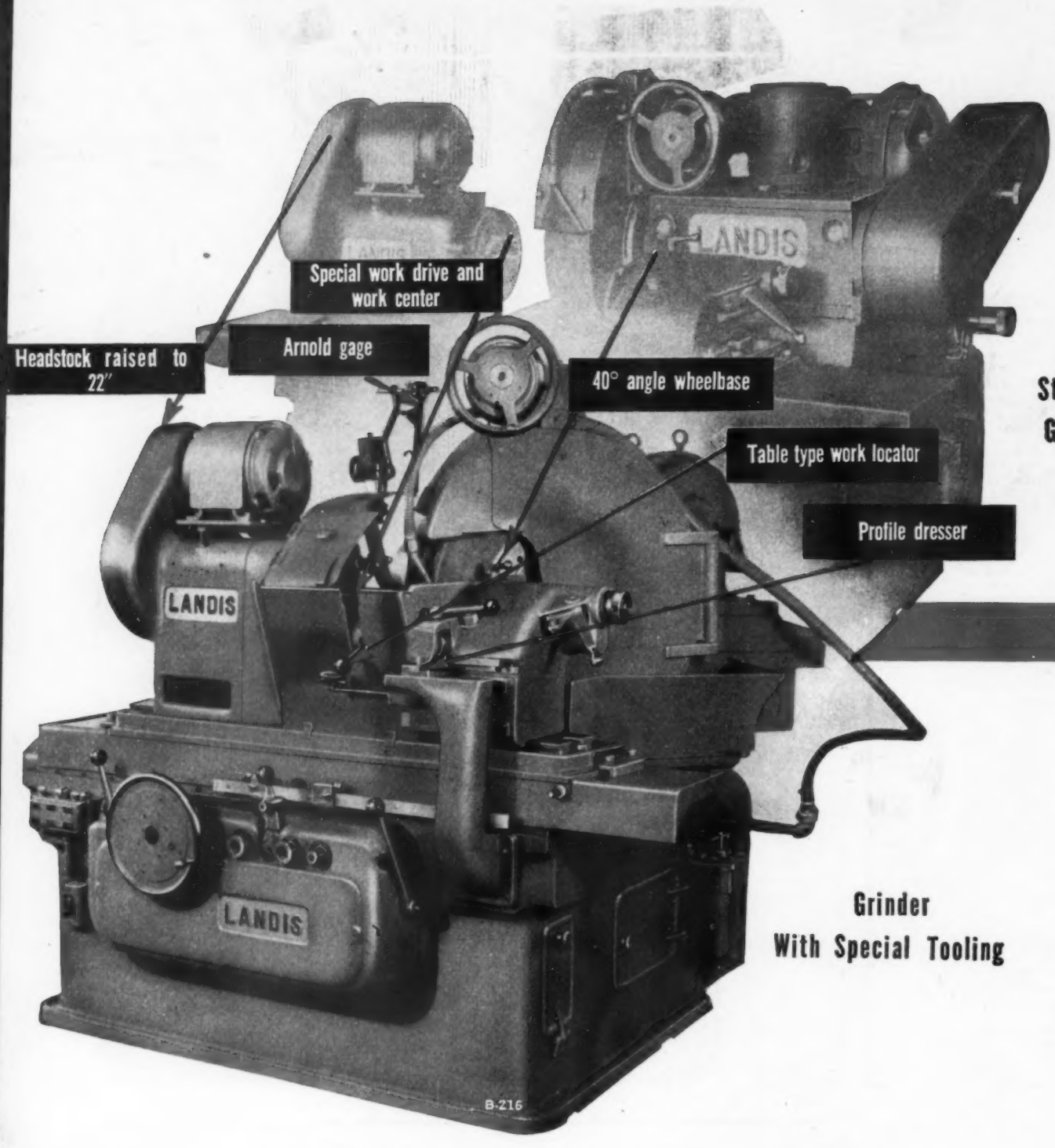
WORLD'S MOST COMPLETE DRILL PRESS LINE


16" No. 3000 F.V. 2-Spindle Box Column Floor Drill
16" No. 3000 F.V. 1-Spindle Box Column Floor Drill
16" No. 5—10,000 R.V. 2-Spindle Bench Drill
14" No. 3000 F.V. 1-Spindle Sensitive Floor Drill
21" Sliding Head Floor Drill
2-Spindle 21" Box Column Sliding Head Floor Drill
21" Box Column Sliding Head Floor Drill
6-Spindle 21" Box Column
4-Spindle 21" Box Column

Drill presses, bearing the familiar CANEDY-OTTO name, are found in factories the world over — testifying to the world-wide, long-time acceptance of CANEDY-OTTO, "The World's Most Complete Drill Press Line." Before you specify or approve any drill press purchase, make a careful review of the CANEDY-OTTO line — a line providing an economical, standard unit for a very wide range of drilling requirements. Write us today for catalog, putting detailed information on the complete CANEDY-OTTO Drill Press line at your fingertips.

CANEDY-OTTO MFG. CO. CHICAGO HEIGHTS, ILL.

7 Steering Knuckle Diameters Ground on *One* Machine with 3 Setups



Standard Grinder

Grinder With Special Tooling

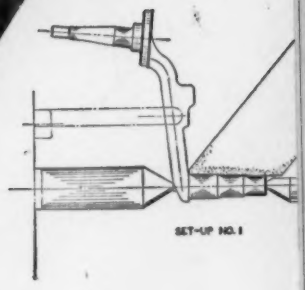
LANDIS TOOL *Precision Grinders*

Your grinding problem may be simpler or far more complex than this one. With Landis Tool Engineered Grinding Service you will get a similar low cost solution. Write us details for a recommendation. 59

LANDIS TOOL COMPANY, WAYNESBORO, PA.

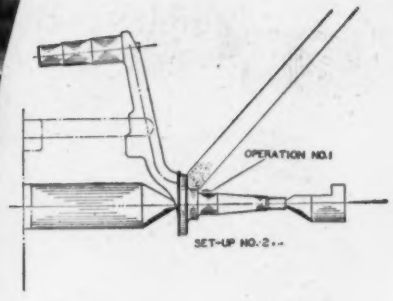
Setup #1

To grind 26.613—28.710—31.455 m.m. diameters. Profile truing fixture, operated by the power traverse. 4" face wheel and wheel guard. Caliper frame for 31.455 diameter. Wheel 30" x 4" x 12".



Setup #2
Operation 1

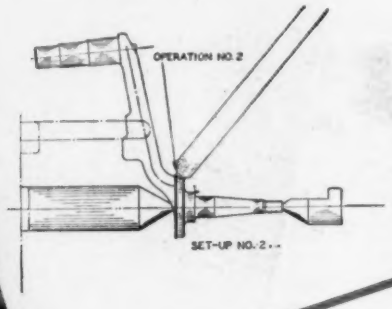
To grind 36 m.m. diameter Right angle wheel truing fixture. 1" face wheel and wheel guard. Caliper frame for 36 and 72 m.m. diameters. Wheel 30" x 1" x 12".

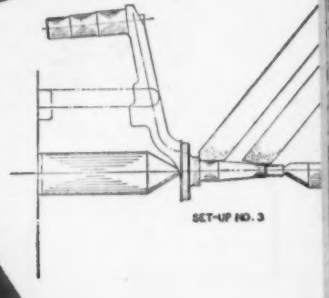


How a Tough Grinding Job was Solved with Special Tooling

Setup #2
Operation 2

To grind 72 m.m. diameter. Right angle wheel truing fixture. 1" face wheel and wheel guard. Caliper frame for 36 and 72 m.m. diameters. Wheel 30" x 1" x 12".





Setup #3

To grind 15.870 m.m. diameter—25.400 m.m. diameter. Double wheel center. Profile bar for wheel truing fixture. Wheel 27¼" x 1¼" x 12".

THE AMERICAN TOOL WORKS CO.

THIS *SHOWS* IT BETTER THAN WE CAN *TELL* IT . . .

THIS IS one of those "high" jobs with the arm as high as it will go. But note that all control levers on the head are still within easy reach of the operator.

The value of the "American" Hole Wizard's concentrated control at the bottom of the head is clearly demonstrated by this job.

Note, also, how easy it is for the operator to make the speed changes for the different tools. Not only are the speed change levers within easy reach, but the speed change mechanism is direct reading so the operator can see how to get the speed he wants and get it quickly without fear of mistake.

Operators like "American" Hole Wizard Radials. Ask the man who runs one—see what he says. An operator gets more work from a machine he likes.

Descriptive Bulletin No. 327 tells the whole story. Want one?

I'm grinding to
.0001"-continuously
-without variation!

Yes, He's using the NORTONIZER*...

The Norton Automatic Work Sizing Device that's producing close limit work at new levels of low cost

The NORTONIZER is a real cost cutter. Hour after hour it clicks out work that's really accurate to a tenth of a thousandth of an inch — and at a real production rate. Manual effort is reduced; less operator skill is required; inspection time is reduced; spoilage is reduced.

And it's in outstanding plants, known for their production efficiency, that the NORTONIZER is showing its cost cutting ability.

NORTON COMPANY, WORCESTER 6, MASS.

New York - Chicago - Detroit - Cleveland - Hartford

Distributors in All Principal Cities

*Trade-mark registered U. S. Patent Office

M-531

NORTON GRINDERS and Lappers

"THE STORY OF THE TWIST DRILL IS THE STORY OF MORSE"

Aborigine with Shaft Drill

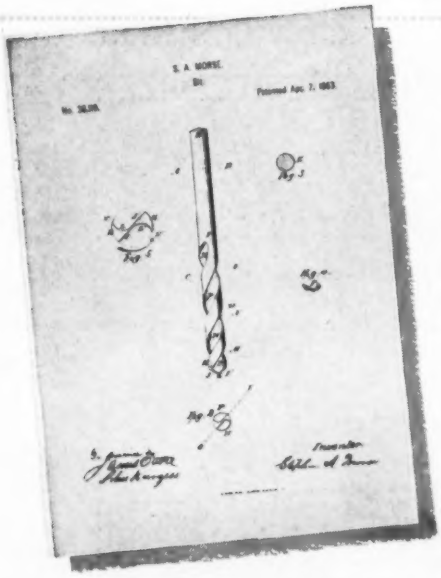
Egyptian with Bow Drill

Chinaman with Pump Drill

For Many Centuries They Drilled It the "HARD WAY" ...until

STEPHEN A. MORSE

Put his New Twist onto the old flat Drill



Signed and witnessed patent drawing of first Morse Twist Drill.

It was a long way from the aboriginal drill to the original Morse Twist Drill. All the way from a prehistoric cave to Bridgewater, Massachusetts . . . where Steve Morse patented his invention in 1863.

At first, all Morse Twist Drills were carbon steel, hand-cleared. Then high-speed steels were tried . . . *and forged* . . . and the Morse Drill won new users by the thousands. Meanwhile, groove-area and twist-cut angle were changed to step up speeds and feeds . . . and drills with oil-holes were developed for deep drilling. Next came cobalt steel drills for hard materials . . . drills tipped with tungsten carbide . . . and drills specially treated for abrasion resistance.

Then, as Morse development sped ahead, came standard and special drills for hard rubber, slate, plastics, brass, steel (including manganese) light metals, wood, paper. Today, whatever your drilling job, you can get exactly the Morse Twist Drill you need to do that job with highest speed and accuracy, at lowest cost. Ask your Industrial Supply Distributor, *now*, to get you a Morse specification . . . and count yourself in on all the benefits of Morse's steady advance in twist-drill development.

Workman of 1862
with Flat Drill

In only 83 years (from the time of the old flat drill) Morse development has ranged from the patenting of the milled twist drill to the modern, high-precision, long-lived High-Speed Drill.

Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manufacture

MORSE TWIST DRILL & MACHINE COMPANY

The Original Manufacturer of Twist Drills

NEW BEDFORD, MASSACHUSETTS

NEW YORK STORE: 130 LAFAYETTE ST. • CHICAGO STORE: 570 WEST RANDOLPH ST. • SAN FRANCISCO STORE: 1180 FOLSOM ST.

NORBIDE GAGES

Give up to 200 times longer life on severest gage-wearing job—measuring center holes in grinding wheels.

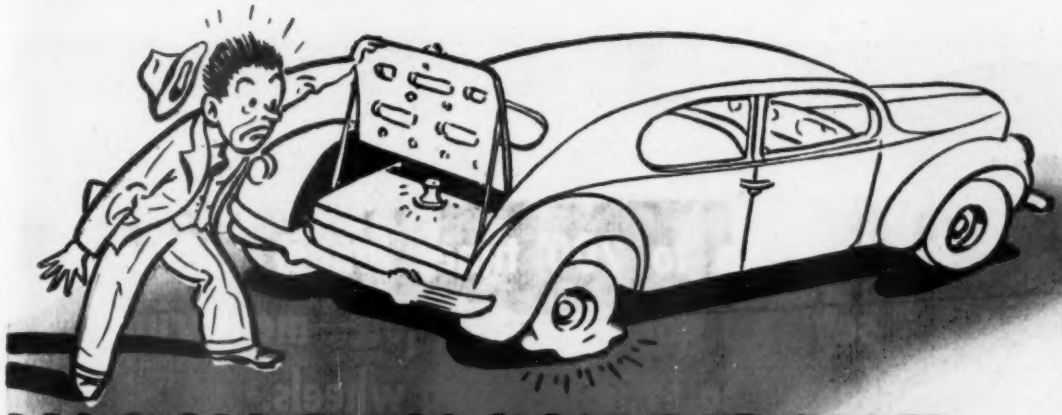
NO job could be a more severe test of the wear-resistance of gages than that of measuring center holes in grinding wheels. Not only do the hard, sharp grains of abrasive cause an abrasive action as the gage is inserted in the grinding wheel, but also the manufactured abrasives, aluminum oxide and silicon carbide, are themselves harder than many of the metals commonly used on measuring devices. Here, as in many production measuring jobs, is the place to use NORBIDE gages, manufactured of Norton Boron Carbide, the hardest material made by man. The extreme hardness of NORBIDE gages enables them to outwear many other types of gages hundreds of times and eliminates the costly, time-consuming requirement of frequently checking gages for accuracy.

NORTON COMPANY, WORCESTER 6, MASS.

NORBIDE* – The Hardest Material Made by Man

NORTON BORON CARBIDE

Trade-mark Reg. U. S. Pat. Off.



WOULD YOU DRIVE WITHOUT A *Spare?*

"Just my luck! A flat tire and no spare! What a predicament!"

A machine shop foreman may be in a worse predicament without a spare arbor. When an arbor breaks, production ceases until the arbor is replaced. Machine and manpower hours wasted! Schedules disrupted! Deliveries delayed! That's why we say —

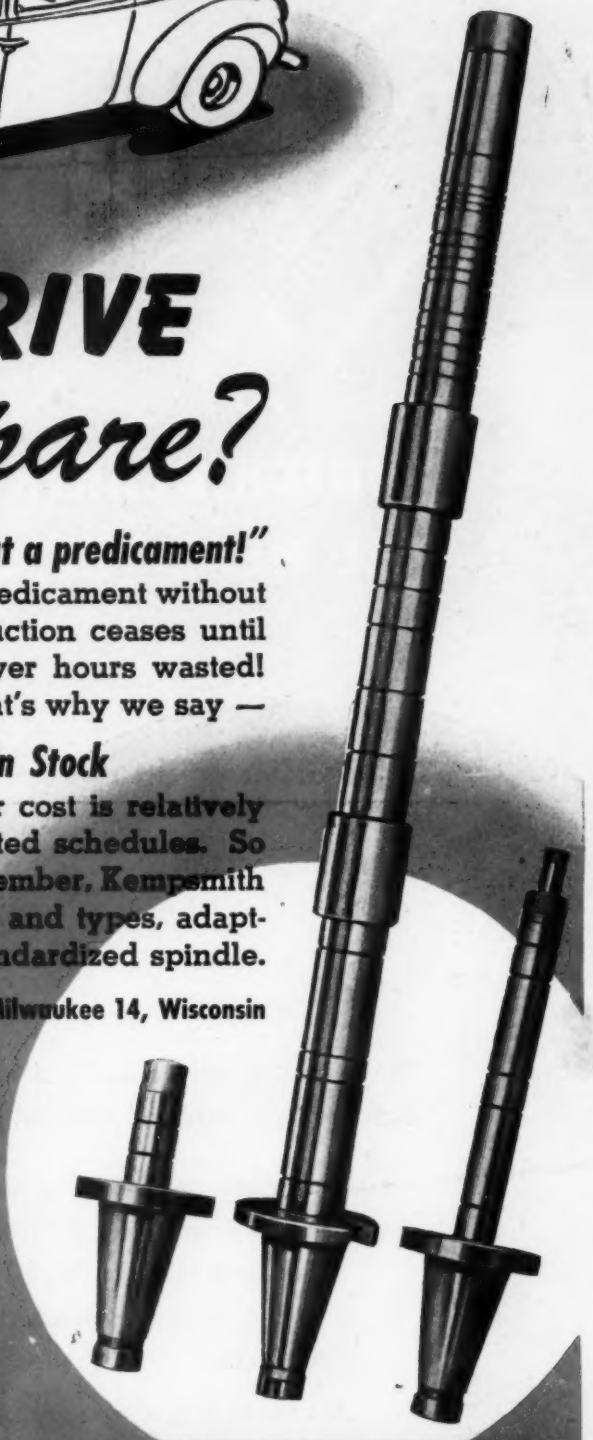
It Pays to Have Several Arbors in Stock

Arbors are "perishable tools" and today their cost is relatively small in comparison to lost hours and disrupted schedules. So play safe! Order your spare arbors today. Remember, Kempsmith Arbors are now available in all popular sizes and types, adaptable to any make of milling machine with standardized spindle.

THE KEMPSMITH MACHINE CO. • 1821 S. 71st Street • Milwaukee 14, Wisconsin

Get Your Copy of this NEW ARBOR BULLETIN

Describes the complete Kempsmith line of Arbors and Accessories. Also gives you helpful information on how to keep your arbors in condition. Fill in and mail coupon — today. No obligation.



Arbors BY KEMPSMITH

Precision Built Milling Machines Since 1888

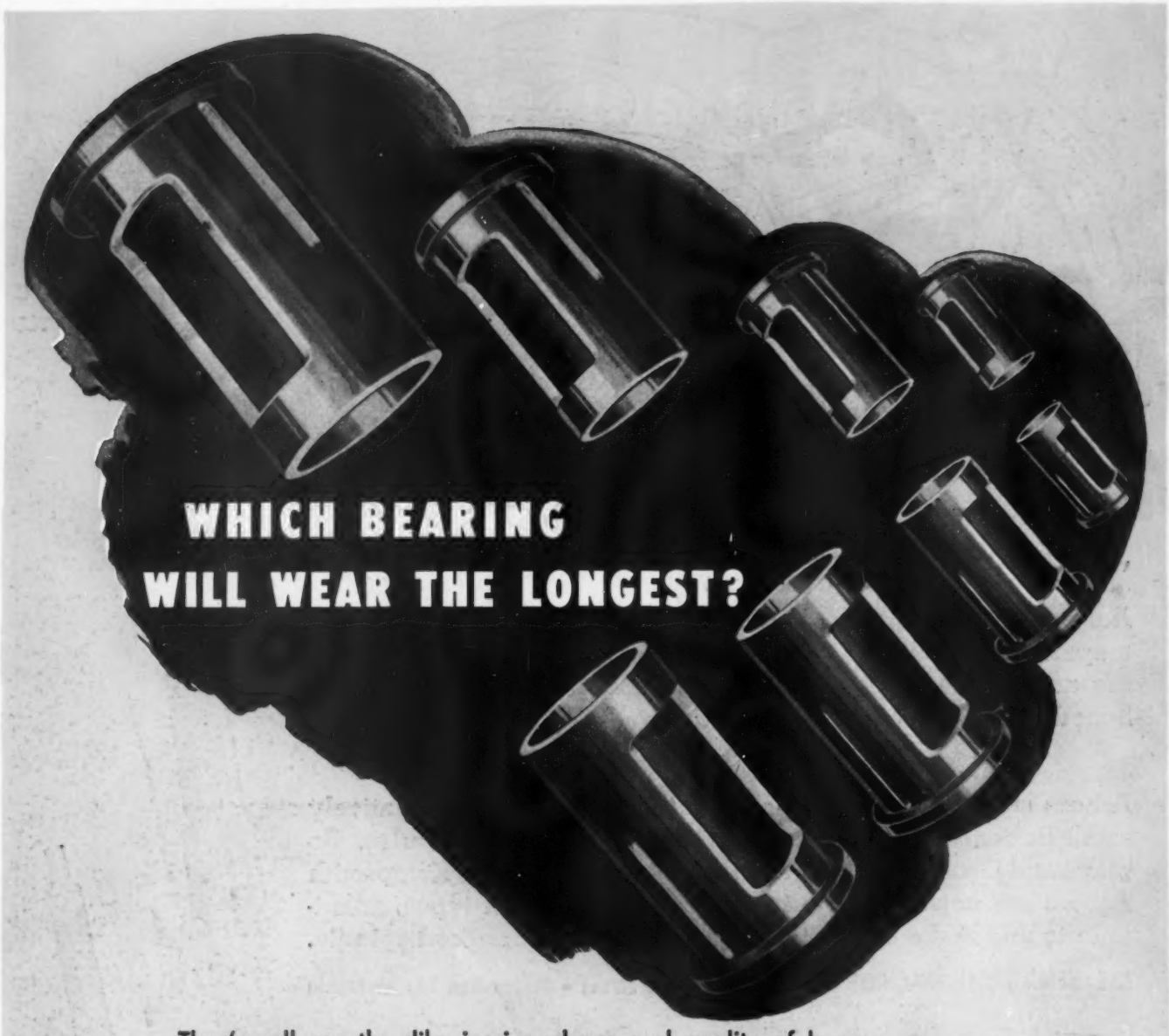
Write Today!

KEMPSMITH — Yes, I would like to receive a copy of your new Arbor Bulletin:

NAME ..... **TITLE** .....

FIRM ..... **ADDRESS** .....

4594-1P-C



WHICH BEARING WILL WEAR THE LONGEST?

They're all exactly alike in size, shape and quality of bronze. But there's a mighty important invisible difference—the *alloys*.

That slight change in composition—often only a fraction of one per cent—can make a huge difference in service. Through years of research N-B-M has perfected scores of "minor" variations for different requirements which give bronze bearings and parts far longer life.

A new N-B-M alloy may be just the answer you're looking for.

N•B•M

BRONZE BEARINGS AND PARTS

NBM

AMERICAN Brake Shoe COMPANY

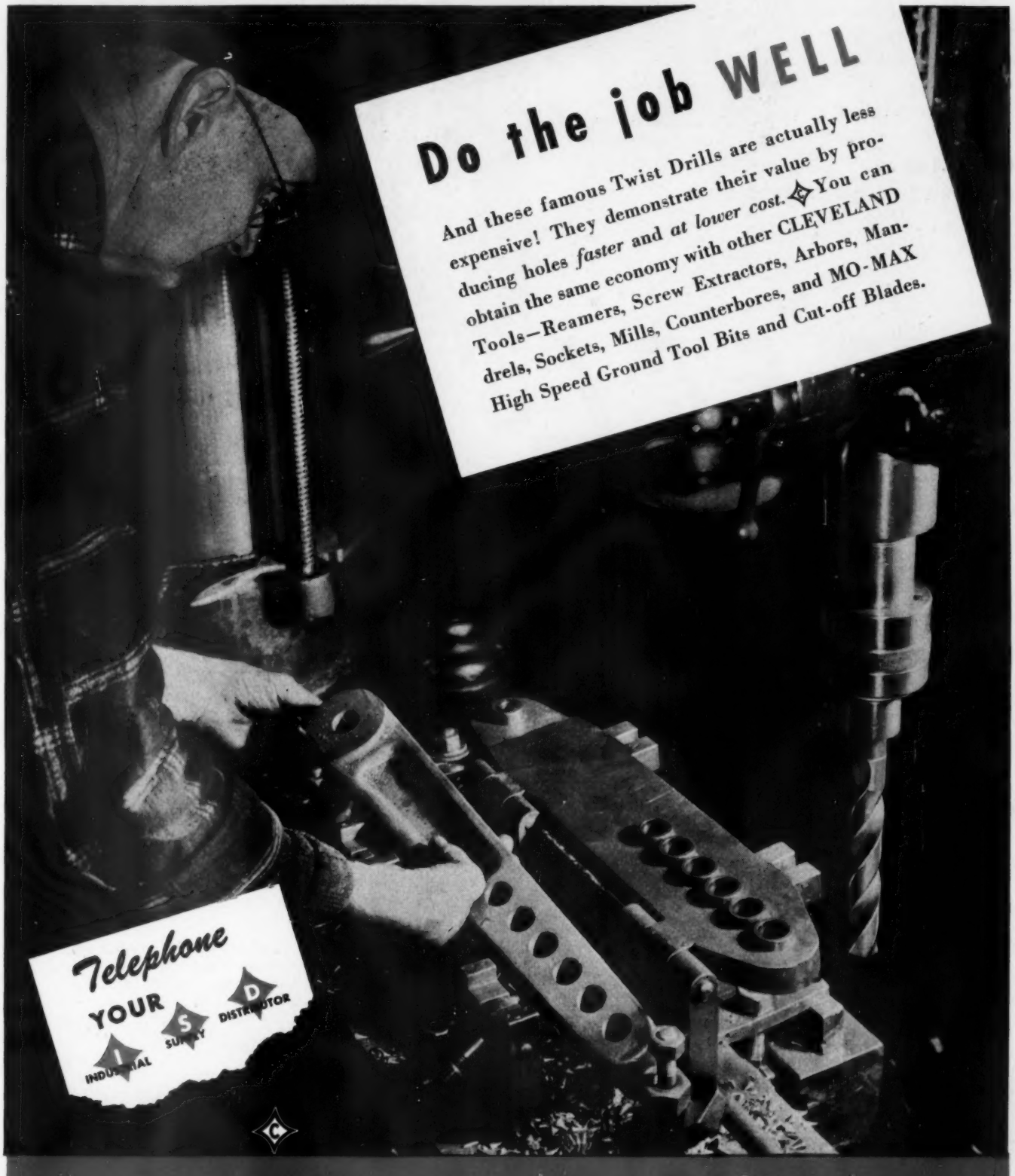
NATIONAL BEARING DIVISION

ST. LOUIS • NEW YORK

PLANTS IN: ST. LOUIS, MO. • PITTSBURGH, PA. • MEADVILLE, PA. • JERSEY CITY, N. J. • PORTSMOUTH, VA.• ST. PAUL, MINN. • CHICAGO, ILL.

CLE-FORGE HIGH SPEED DRILLS

TRADE MARK REG. U.S. PAT. OFF.


Do the job WELL
And these famous Twist Drills are actually less expensive! They demonstrate their value by producing holes *faster* and *at lower cost.* You can obtain the same economy with other CLEVELAND Tools—Reamers, Screw Extractors, Arbors, Mandrels, Sockets, Mills, Counterbores, and MO-MAX High Speed Ground Tool Bits and Cut-off Blades.
Telephone YOUR INDUSTRIAL SUPPLY DISTRIBUTOR

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49TH STREET
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TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

9 THOMAS ST., NEW YORK 7 • 9 NORTH JEFFERSON ST., CHICAGO 6 • 650 HOWARD ST., SAN FRANCISCO 5
2925 EAST GRAND BLVD., DETROIT 2 • 1902 NORTH FIELD ST., DALLAS 1
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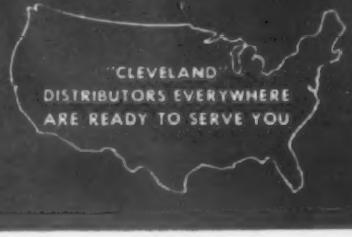
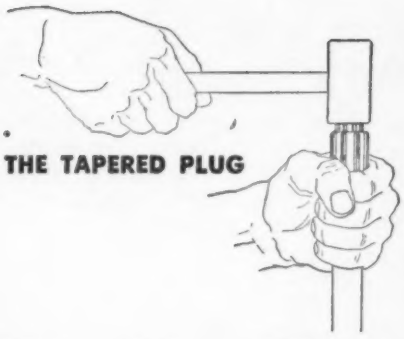
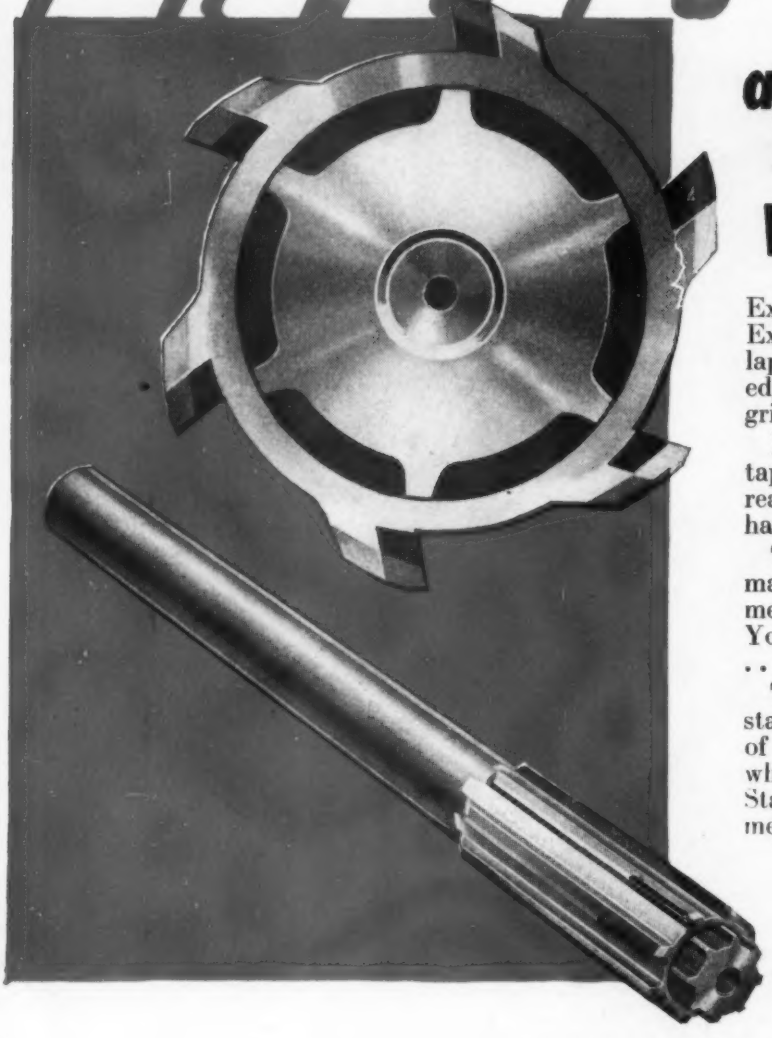


Staples
CARBOLOY-TIPPED EXPANSION REAMERS



TO EXPAND . . .
JUST DRIVE IN THE TAPERED PLUG

PRECISION . . .



again and again and again— WITHOUT REGRINDING

Expand the solid body of a Staples *exclusive* Expansion Reamer. Tilt back the diamond-lapped Carboloy Cemented Carbide cutting edges. Do this again and again, without regrinding . . . and get precision every time.

Instead of regrinding, simply drive in the tapered plug and increase the diameter of the reamer to compensate for the amount that has worn.

The patented Staples Expansion Reamer is made with a one-piece body—not split. This means rigidity—and rigidity means precision. Your results are finer finish, longer tool life . . . real economy.

This exceptional tool met the exacting standards of wartime construction. It is one of a line of quality circular cutting tools used wherever very close tolerances are held. Standard tools in stock for immediate shipment. Special tools designed.

THE STAPLES TOOL COMPANY
Formerly Staples Tool & Engineering Company
CINCINNATI 25 OHIO

Staples CARBOLOY-TIPPED CIRCULAR CUTTING TOOLS

REAMERS • CORE DRILLS • SPOT FACERS • COUNTERBORES • END MILLS • SHELL END MILLS • ALSO A COMPLETE LINE OF CIRCULAR SPECIAL TOOLS

The CONE AUTOMATIC MACHINE COMPANY sees many GOOD THINGS AHEAD

It is reported that . . . . . .

A. O. Smith's new plant at Kankakee will have the largest radiant heating plant on record. Water, heated to 140 deg. by 120 separate heaters will circulate through 40 miles of pipe laid in the floor slab.

get ready with CONE for tomorrow

The making of acetylene from natural gas is being studied and reports may be expected from the Department of Commerce.

get ready with CONE for tomorrow

Muncie Gear Works proposes to market a "reverse cycle" heating plant this year.

get ready with CONE for tomorrow

Truck bodies of magnesium are being made by Barry and Bailey Co. of Philadelphia.

get ready with CONE for tomorrow

Blue Mountain Clay Co. of Memphis makes a new oil, grease and water absorbent for oily and wet floors that is said to absorb 120% to 140% of its weight.

get ready with CONE for tomorrow

The Public Health Service announces that satisfactory substitutes for mercury have been found that end the hazard of mercury poisoning (the origin of the term "mad hatter") in the hat making industry.

get ready with CONE for tomorrow

In a new thickness gage, designed by Glenn L. Martin Co., a dial registers the deflection of a sheet of metal when a predetermined vacuum is created on one side of it.

get ready with CONE for tomorrow

The idea of the variable pitch propeller has been applied to industrial fans by Evans Products Co. Operated by a built-in thermostat, it maintains constant engine operating temperature.

get ready with CONE for tomorrow

An electrically conductive, nonsparking linoleum has been introduced by Congoleum-Nairn.

General Electric has patented a new type of household refrigerator which maintains temperature at two levels simultaneously.

get ready with CONE for tomorrow

The Bureau of Mines has recently released information on its process for the electrolytic method of producing manganese.

get ready with CONE for tomorrow

Pullman-Standard has increased its output of car wheels ten times by using a machine which revolves the tool instead of the wheel.

get ready with CONE for tomorrow

National Tube Co. claims that its new plant at Lorain, Ohio, is the world's first straight-line seamless pipe mill. It produces 2,000 feet of seamless steel pipe per minute.

The Office of Technical Services of the U. S. Dept. of Commerce reports on a silver-magnesium solder that can withstand the heat of gas turbines.

get ready with CONE for tomorrow

"Multi-tule", a profile blade type form tool holder, is to be made available to users of a well-known make of multi-spindle automatic lathes. The holder is particularly adaptable to short runs and cuts down time in tooling change-overs. It reduces the number of holders ordinarily required for a number of jobs.

get ready with CONE for tomorrow

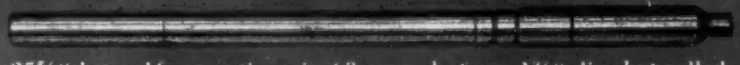
Dr. Baetjer, of Johns Hopkins University, prophesies that by 1950 one in every three women over fourteen will be employed in industry.

get ready with CONE for tomorrow

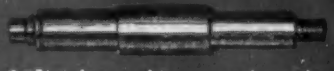
The *USS Salem* and *USS Newport News*, now being built, will be the first ships in what is promised to be a completely air-conditioned Navy.

FOLLOW THESE PAGES FOR NEWS OF PROGRESSIVE PRODUCTION

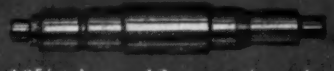
Emphatically Conomatic!



25⅝" long, 16 operations in 63 seconds from 1⅜" dia. hot rolled.

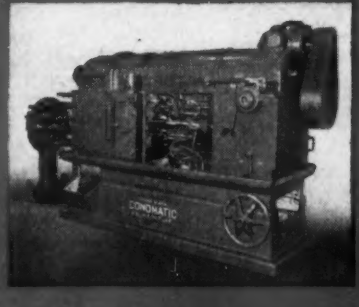


10⅞" long, 16 operations in 65 seconds from 1 41/64" dia. SAE 4620.



10⅝" long, 12 operations in 54 seconds from 1⅝" dia. SAE 3115.

Any good multiple spindle automatic should handle the ordinary run of shaft work. But Conomatics are also adaptable to the unusually *tough* jobs. The illustrations show this plainly.

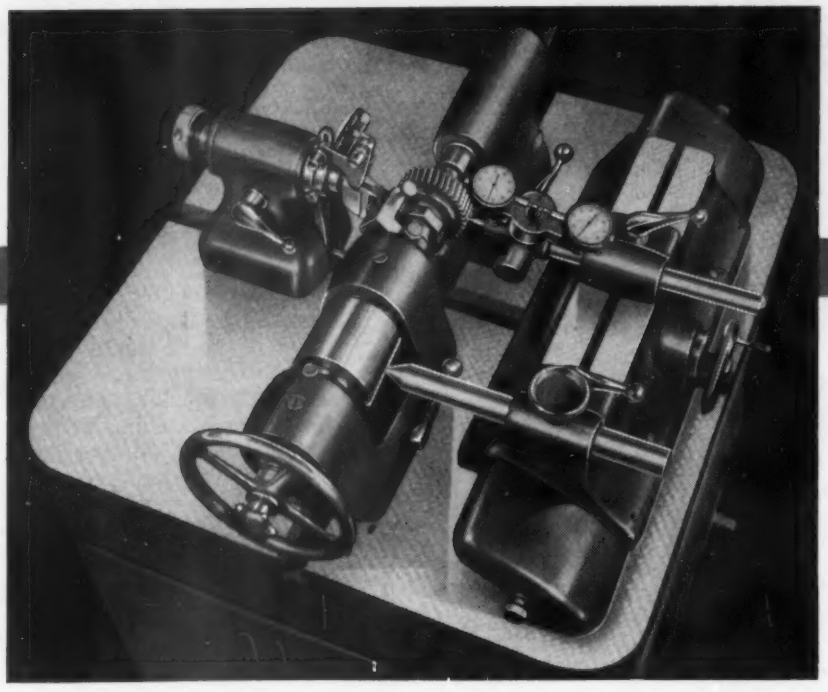


Ask your CONE *representative to show you our new color motion picture*

CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

35



Check GEAR TEETH for DIMENSIONAL ACCURACY

The Red Ring Universal Gear Checker is an instrument for quickly and accurately checking the dimensional errors of both spur and helical gear teeth—such errors as index, helical angle, lead, parallelism, tooth size, eccentricity, interference and wobble.

The various heads used on this instrument are so ingeniously designed that the human error in their use is practically eliminated. Consequently, the average shop man can inspect gears quickly and accurately. It doesn't require a skilled inspector.

CAPACITIES OF RED RING GEAR CHECKERS:

12″ for gears ¼″ to 12-1⅛″ O. D. • 18″ for gears 2″ to 18-⅞″ O. D.
24″ for gears 3″ to 25-½″ O. D.

Alterations can be made for special applications

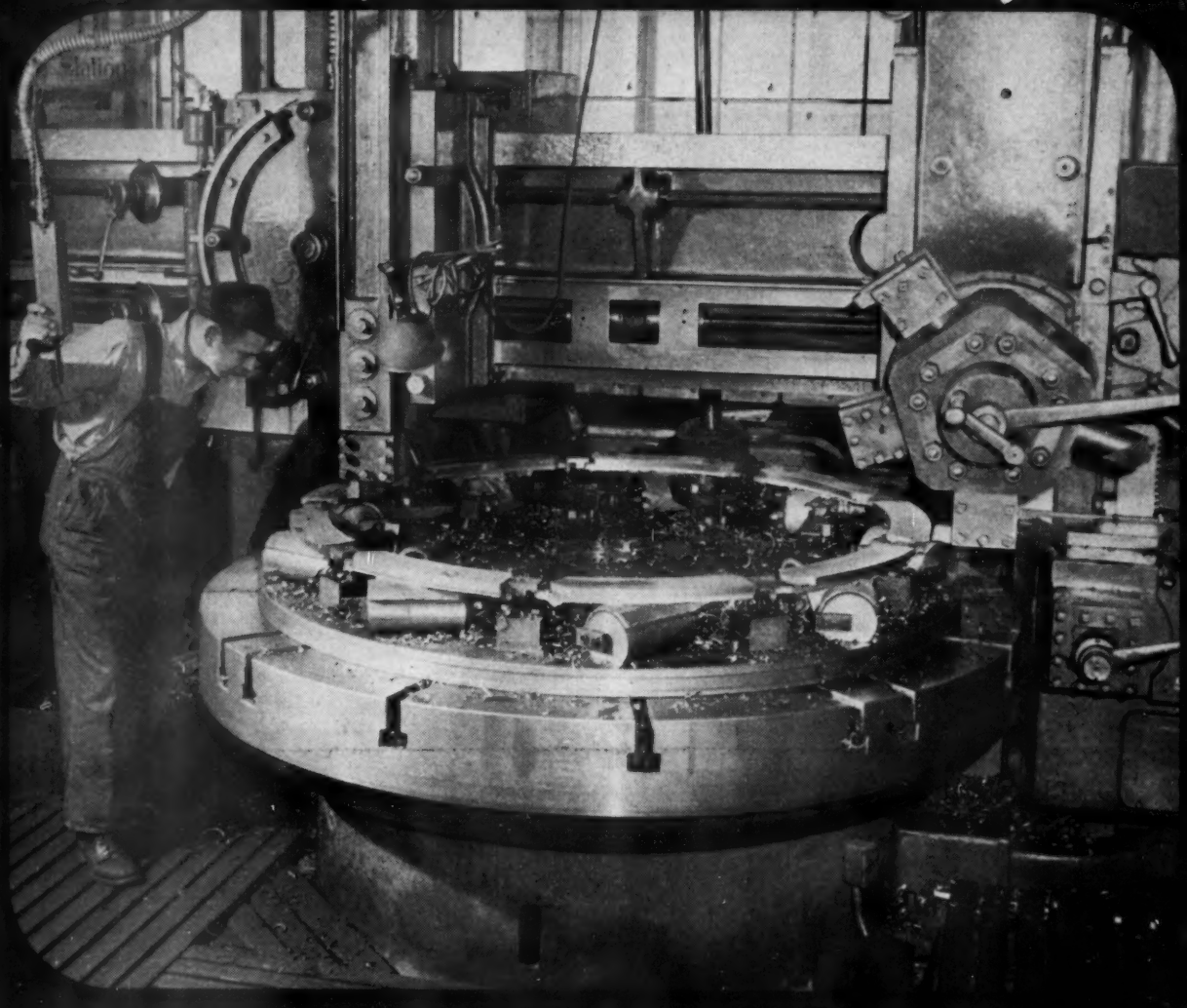
NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN *RED RING ◯ PRODUCTS* **DETROIT 13, MICH.**

SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE

ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

Here's how one manufacturer gets greater production from his



KING Vertical Boring & Turning Machine

Above—Nine cast steel trailer-link slides are being machined simultaneously on this King Vertical Boring & Turning Machine.

Ask us about the NEW Series KING

Vertical Boring & Turning Machines available in the following sizes: Single Column Type 30", 36", 42"; Double Column Type 52", 62", 72", 84", 100", 120", 144".

● To increase production and reduce downtime, this manufacturer designed and built set-up plates on which nine cast steel trailer-link slides could be ganged and machined at one setting. Four plates were built—two for trailer link shoes, one left hand—one right hand, and two for trailer link slides. The plate for the shoes held 16 pieces.

While the machine was operating, a helper would unload and re-load the set-up plate ready for the machine.

The King Boring & Turning Machine bored and faced the work on a high production basis—16 pieces on one set-up, and 9 on the other.

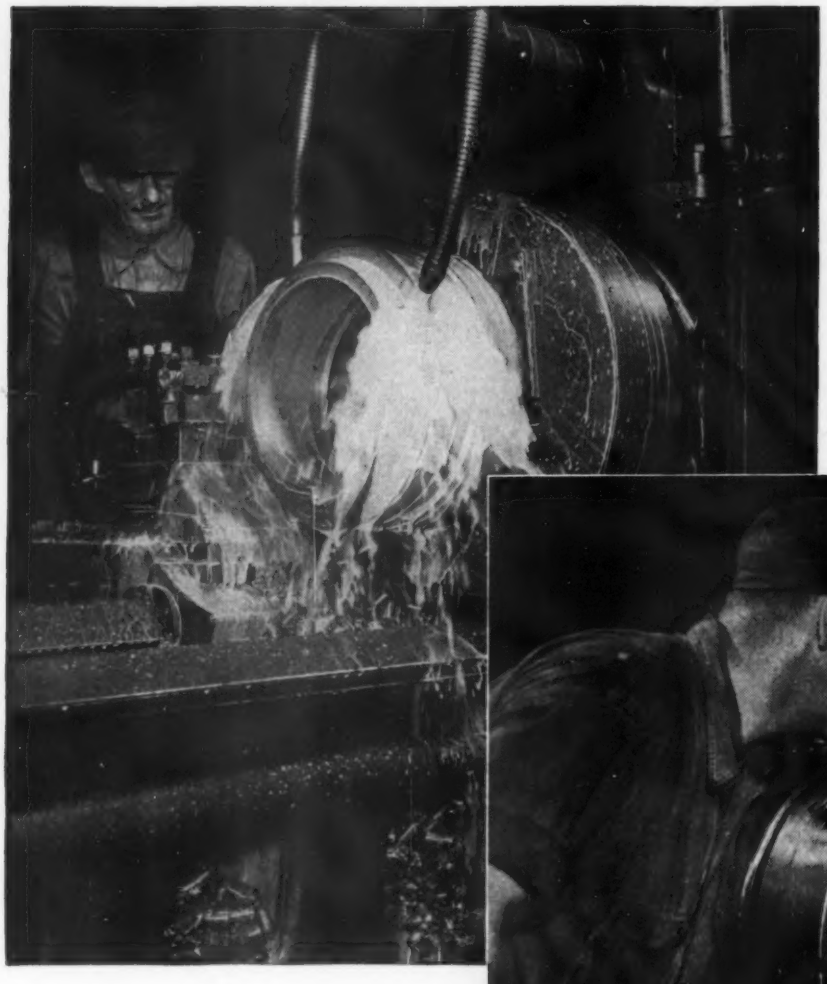
When you have a high production problem—where boring, turning, and facing operations are required, put the job on a King—for speed—for precision—for production.

THE KING MACHINE TOOL COMPANY

CINCINNATI 28 OHIO

BUILDERS OF VERTICAL BORING AND TURNING MACHINES

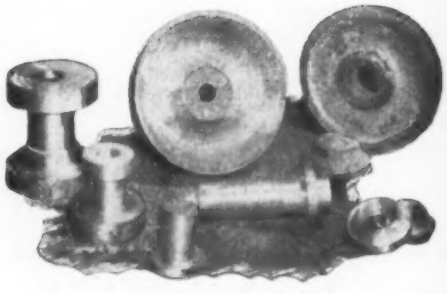
They really hog out on these



Their extreme precision has given Warner & Swasey Turret Lathes an outstanding reputation in the metal working industry. But they also have the stamina and power to cut heavy chips of tough steel, when fast removal of metal is the important factor.

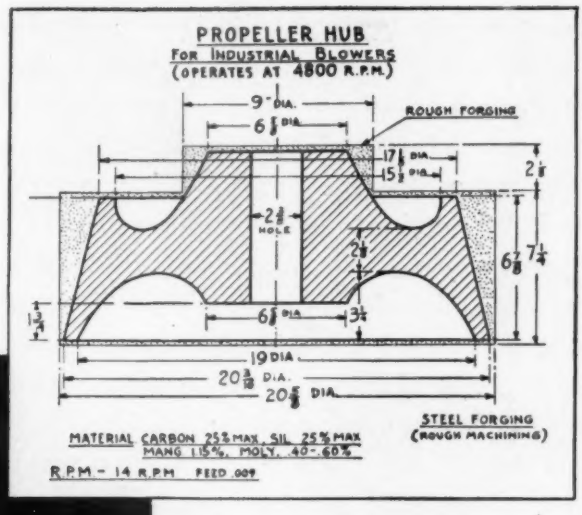
In the picture at the left, a Warner & Swasey 4-A Heavy Duty Turret Lathe is roughing out a cap for a pile driving machine from an SAE 3140 forging. Speed, 27 R.P.M.— feed, .025".

The job pictured below calls for heavy combined cuts in turning, boring and facing operations on a roll head plug for stone crushing machinery.



TURRET LATHES, MULTIPLE SPINDLE AUTOMATICS, PRECISION TAPPING AND THREADING MACHINES

metal rugged jobs!



Some of the many massive parts turned out by the Cann & Saul Steel Co., for heavy duty machinery are shown above. The one being pointed out by Mr. R. Freed, Cann & Saul Superintendent, is a propeller hub for industrial blowers, built to operate at 4800 R.P.M.

The working drawing for the propeller hub illustrates the large amount of metal removed in rough machining the steel forging. A Warner & Swasey 4-A Saddle Type Turret Lathe takes off the excess steel with —heavy slab facing cuts on the contour surfaces.

● The Cann & Saul Steel Company, Royersford, Pa., forge heavy parts from steel billets, then rough machine them into shape before delivery to customers for finish machining. The machine tools that rough shape the parts must be able to take the punishment of continuously hogging off tough steel rapidly.

Cann & Saul use Warner & Swasey Turret Lathes for this gruelling work because they find that Warner & Swaseys can do the job *faster than any other turret lathes of comparable size,* and yet stand up under severe usage.

Warner & Swasey Turret Lathes excel at this kind of work because of their extreme power and rigidity. They are powered to take cuts at high speeds; they have the rigidity to withstand shock and stress from sustained operation under heavy feeds.

Regardless of the work to be done, roughing out tough steel forgings, or taking precise cuts on small parts, a Warner & Swasey Turret Lathe will do the job quickly and at low cost.

WARNER & SWASEY
Machine Tools
Cleveland

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS . . . WITH A WARNER & SWASEY

ANNOUNCING THE NEW

No. 112-M

HYDRAULIC INTERNAL GRINDER

FOR LONG WORK

The *new* No. 112-M Bryant Internal Grinder is designed to precision grind bores up to 9 inches in depth in extra-long, hard-to-chuck parts. Work, such as a machine tool spindle, a long arbor, or a shaft, is supported rigidly, either in a hollow work spindle and steady rest, or by a special fixture that allows the work to run in its own bearings. And, the 112-M offers flexibility that is particularly valuable where production schedules require frequent set-up changes. Adequate longitudinal and swiveling adjustments are provided for grinding tapers up to 30 degrees and reverse tapers up to 10 degrees. A hydraulic retracting mechanism for the wheel slide facilitates loading and gaging long parts, while conveniently located controls simplify operation and set-up. Complete details, capacities and dimensions are contained in the new catalog sheet and will be sent on request — or better still, if you have any work or problems that involve internal grinding—

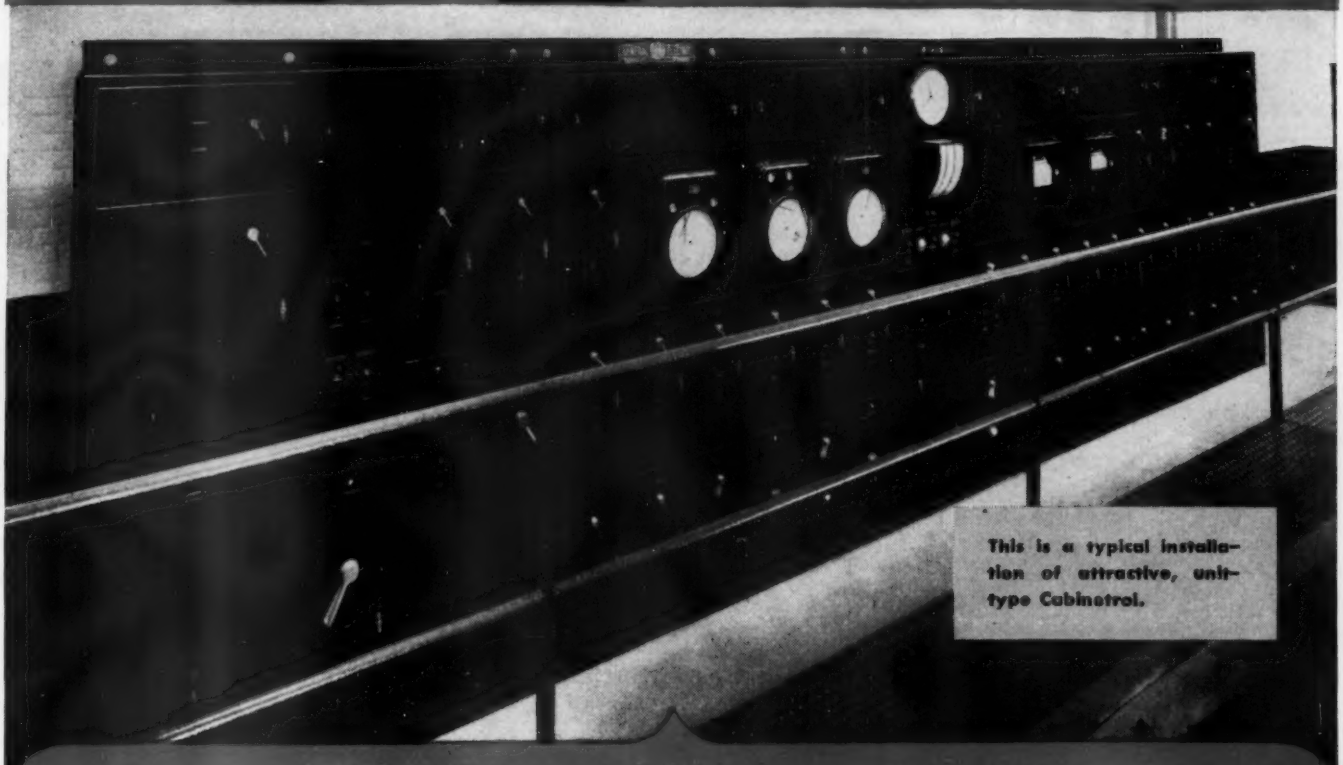
Send for the man from Bryant.

BRYANT

BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

HODGE-PODGE CONTROL IS EXPENSIVE!



This is a typical installation of attractive, unit-type Cabinetrol.

Trim, Modern CABINETROL Cuts Installation Time and Cost

Rambling, space-taking racks are a thing of the past. Control in the *modern* plant is compact, centralized G-E Cabinetrol. It's attractive in design, safe to operate, and it costs no more!

Cabinetrol saves installation time and expense because it's a single, self-supporting unit. No cumbersome frames—no cluttered walls. Just one attractive, all-metal unit that will greatly enhance the appearance of your mill.

The savings in installation cost that you get with Cabinetrol usually far outweigh its higher original cost. Only two operations are necessary—placing the unit in the designated location and connecting external power, motor, and control leads.

IT'S PRE-ENGINEERED

Cabinetrol is based on the use of standard enclosures equipped with the right combination of standard control devices. Each unit is pre-engineered to meet your specific requirements. All starters and accessory equipment necessary to your application are incorporated in the Cabinetrol unit before it is shipped.

PROTECTS YOUR OPERATORS

Because metal-enclosed Cabinetrol is completely deadfront, it offers your operators and servicemen maximum protection. Each motor control is installed in an individual sheet-steel compartment with an interlocking door. Operating mechanisms for motor-circuit switches and air circuit-breakers are available from the front of the panel.

LET US HELP YOU equip your plant with co-ordinated control. We'll be glad to work with you now—to provide a Cabinetrol system specially engineered for your plant—and, if you desire, to help you fit Cabinetrol into your over-all plans.

If you'd like more facts about Cabinetrol ask for Bulletin GEA-3856. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

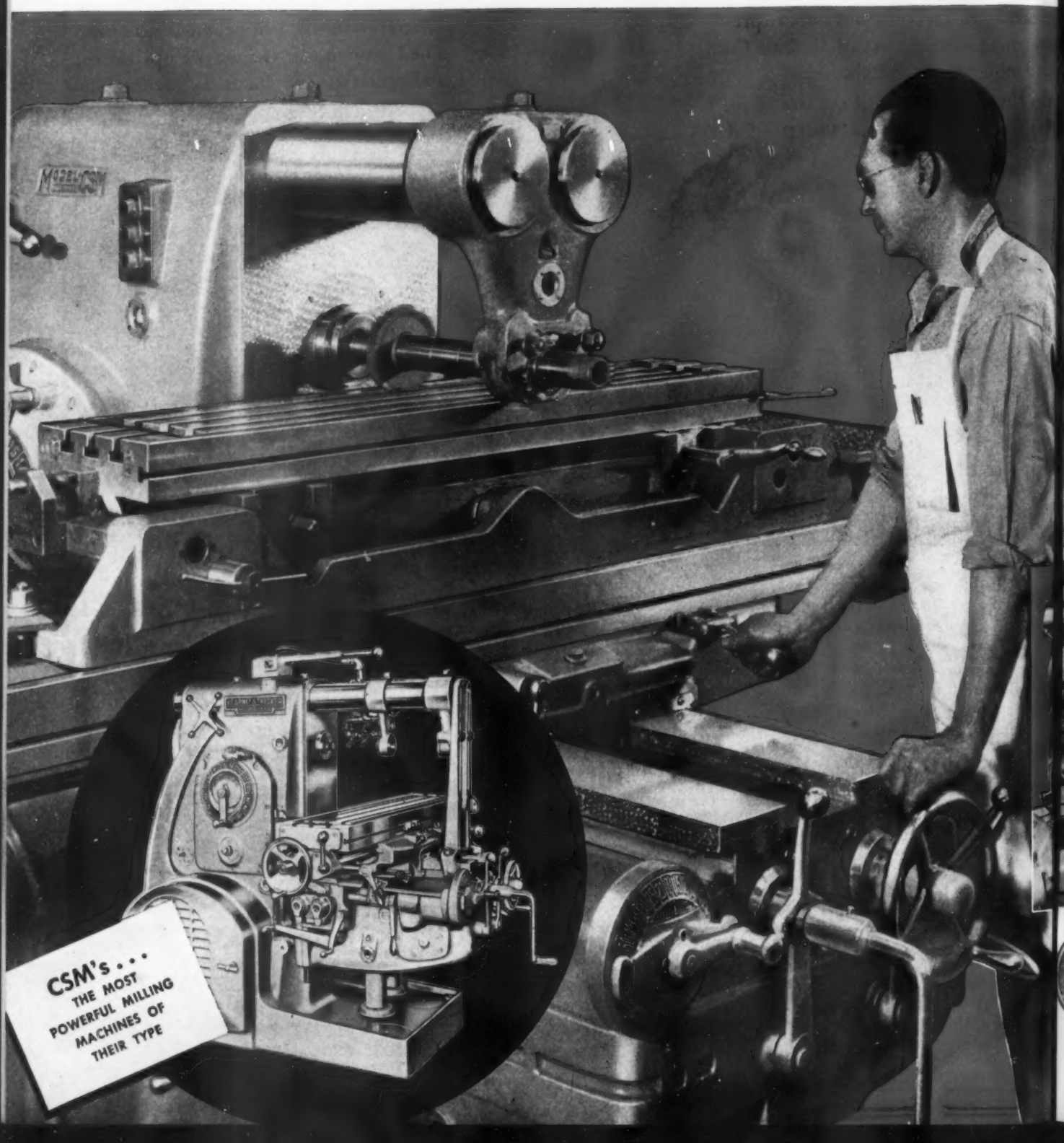
G-E INDUSTRIAL CONTROL

GENERAL ELECTRIC

MILLING CAST IRON

BUT

on a Standard



FAST!

d Kearney & Trecker CSM

Kearney & Trecker CSM's are expressly designed for the most efficient use of Carbide Cutters on ferrous and non-ferrous metals.

On this job, because of the size of the workpiece and fixture — we selected a 50 h.p. CSM plain model — and equipped with the proper cutter, it zipped through the cast iron workpiece easily and speedily. The details of the operation are given below:

OPERATION: Mill coolant trough
WORK PIECE: Milling machine table
MATERIAL: Close-grain, high tensile cast iron
CUTTER: 6" dia., 10 tooth, carbide tipped slotting
CUTTER SPEED: 180 RPM
TABLE FEED: 21 IPM
DEPTH OF CUT: 3/4" to 1 3/4" (3/32"—1/4" each side)
METAL REMOVAL RATE: 15 cu. in. per minute at maximum depth of cut.

NOTE the special fixture which provides maximum rigidity coupled with quick change set-ups on the workpiece and especially facilitates the loading and unloading of the workpiece on the machine.

CSM Milling Machines were designed to obtain the greatest benefits from modern cutting tools, and are part of our line of standard models. The design has been developed after complete analyses of problems of milling with carbide cutters. Machines available in 20, 30 or 50 h.p. models in plain and vertical knee types.

Write for complete data on CSM machines — CATALOG CSM-20. Please indicate your business connection.

Operation 1 . . .

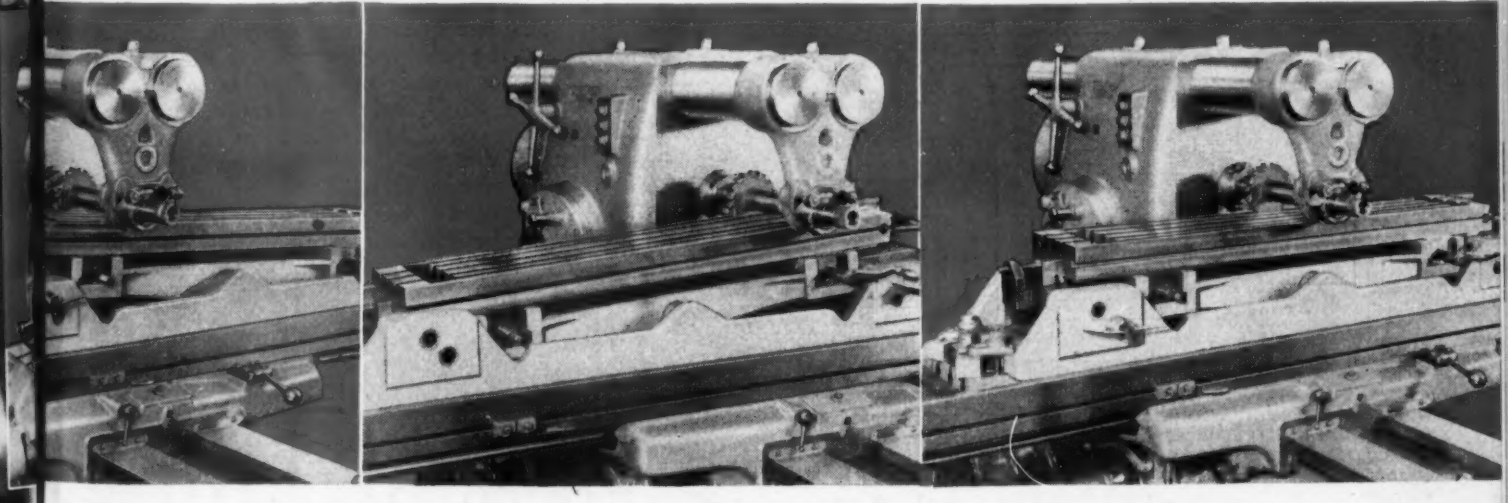
Workpiece tilted to right in fixture. Angular coolant channel is climb milled. Maximum depth of cut: 1 3/4".

Operation 2 . . .

Workpiece tilted to left in fixture. Angular coolant channel conventional milled. Maximum depth of cut: 1 3/4".

Operation 3 . . .

Workpiece held in horizontal position in fixture. The two angular channels now blended by climb milling.



KEARNEY & TRECKER CORPORATION

MILWAUKEE 14, WISCONSIN

BE READY FOR TOMORROW . . . WITH CSM'S

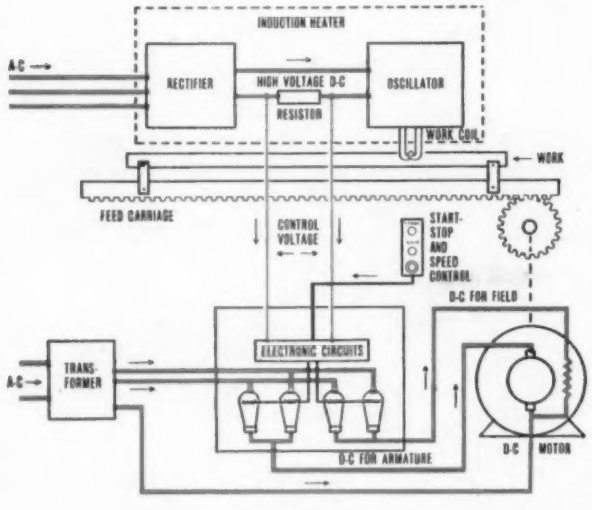
AUTOMATIC ELECTRONIC FEED DRIVE

...brings new precision to continuous induction heating!

G-E Thy-mo-trol matches feed drive speed with heater performance to maintain more uniform quality.

Automatic speed matching with G-E Thy-mo-trol drive continues to make news for machine designers! First, it was matching the rate of feed with the depth of cut on a milling machine. Then, it was keeping conveyor speeds in step with the output of an extruding machine.

AND NOW . . . it's been put to work on an electronic induction heater, maintaining tight quality control! All of this proves a point—where precise, automatic speed matching is required, Thy-mo-trol drive is a wise choice.



Control of this induction heater's feed drive is correlated with the amount of load placed on the heater work coil. Changes in the current of the heater oscillator are reflected as voltage change across a resistor connected in the heater circuit. This voltage adjusts the speed of the motor by controlling the thyratron tubes in the Thy-mo-trol panel. Thus, the speed of the feed motor almost instantaneously follows variations in the load current.

GENERAL ELECTRIC

670-105-8910

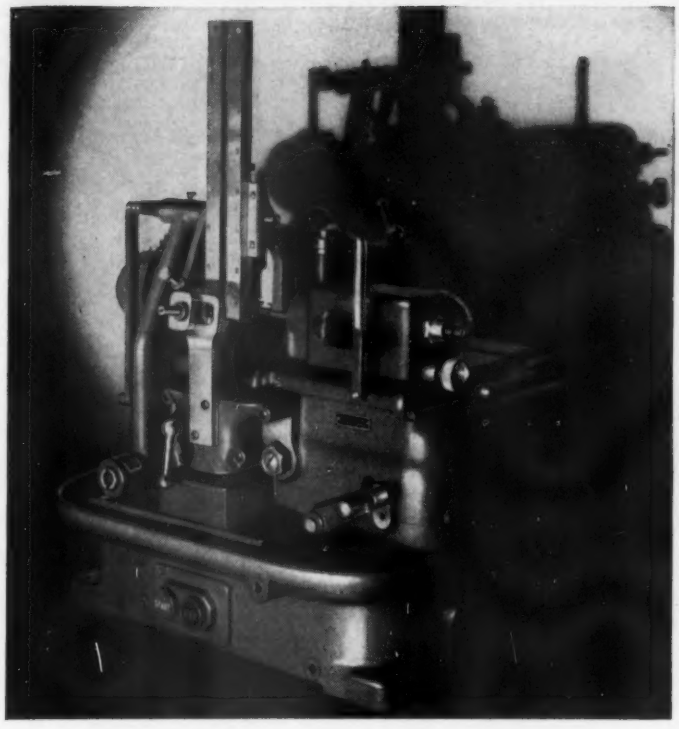
INDUCTION HEATER IS PROOF!

On continuous induction heating, the ability to vary the travel speed is very important in producing uniform heat treatment of parts. Best results can not be obtained with a constant feed rate, because in order to get the desired depth of heat penetration, the speed must be varied as the size of the part varies. Some way of readily adapting the feed speed to the size of part is needed—and Thy-mo-trol drive provides the ideal way. The Thy-mo-trol circuit is connected to the load circuit of the induction heater. In this way, Thy-mo-trol automatically changes the speed of the carriage to maintain constant power output, and thus, uniform control of hardened area. Parts move at speeds which will assure correct heating, rejects are reduced, and high-quality is maintained—because of Thy-mo-trol drive.

INVESTIGATE THY-MO-TROL DRIVE NOW!

Speed matching is but one of the many functions a Thy-mo-trol drive can perform. Some others are stepless control of speed over a wide range; holding constant speed under changing loads; and smooth, rapid, constant-current acceleration. Drives in ratings from 1/8 to 25 hp are now available. Why not get the facts on G-E Thy-mo-trol before you make a decision on your next drive? Your local G-E office will be glad to discuss it with you. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

THY-MO-TROL DRIVE



Get

HIGH PRODUCTION

ON SMALL, FINE-PITCH, HIGH-PRECISION GEARS

with the

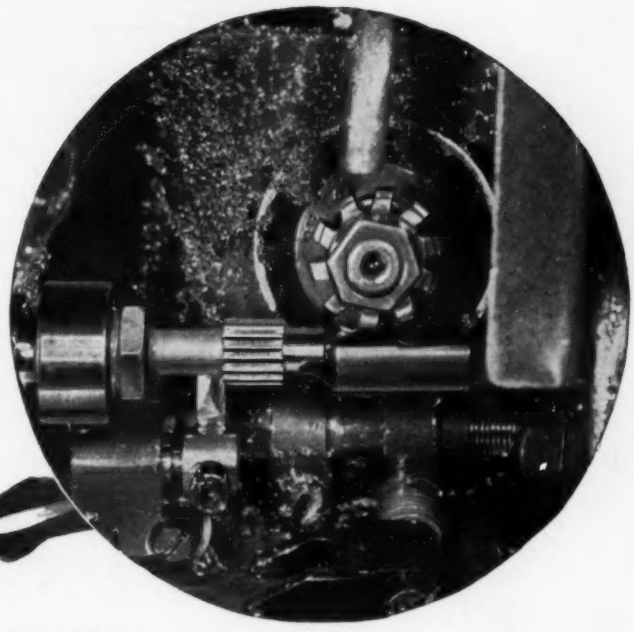
TYPE "S"

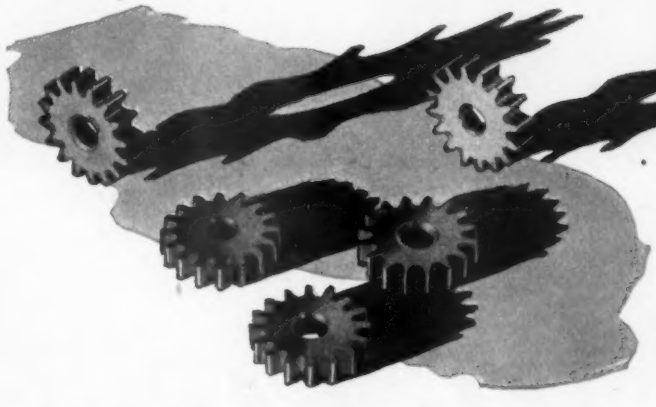
HOBBING

MACHINE

BARBER-COLMAN

The Barber-Colman Type S Hobbing Machine, with fully automatic cycle and magazine loading, is designed to meet modern high speed requirements on small spur gear and pinion production. This excellent machine embodies all of the important qualities of high speed, rigidity and accuracy that are indispensable to large volume production and low operating costs. With accuracy measured in "tenths", cutting time in seconds, and with one operator tending up to 13 machines (merely filling the magazines), this machine invariably produces *new* operating economies. It is imperative, therefore, for manufacturers of small precision instruments, meters, clocks, watches, cameras, and motion picture apparatus not to overlook the many possibilities of this machine when selecting production equipment for small gears and pinions.





JOB FACTS

Piece — Wind Pinion, .360" O.D., .081" face, 16 teeth, 49.4 D.P. Made from 3/8" soft brass rod.

Set-up — Type S Hobbing Machine. Feed per rev. of work .011", hob speed 1583 r.p.m., topping cut. Four pieces per load on special arbor. Hand loading, magazine not used.

Precision — Very high. 100% inspected for runout and tooth form on special fixture, rolled with master.

Production — Cutting time per load — 28 seconds. Hob delivers 800 pieces for each of 3 settings, 2400 pieces per sharpening.

BARBER-COLMAN COMPANY

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U.S.A.

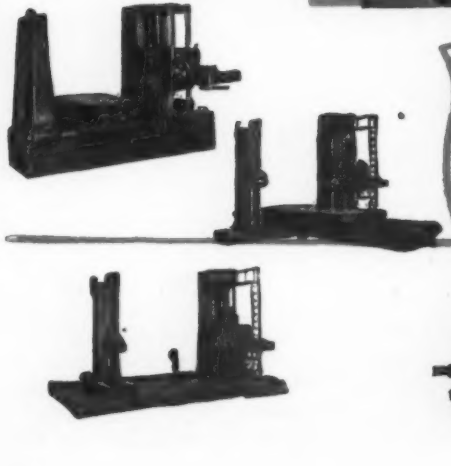
PRODUCTION TIME *Cut* from LOCOMOTIVE

SINGLE WORK SETTING AND SIMPLE ROTATION OF TABLE, POSITIONS GEAR FRAME ON A *Standard* G. & L. FOR ALL END, TOP AND SIDE MILLING AND BEARING HOLE BORING OPERATIONS.

Two locomotive cast steel gear frames are now completed on a Giddings & Lewis Horizontal Boring, Drilling and Milling machine in less time than was formerly taken to complete one. Instead of routing this workpiece to separate machines for planing, slotting and boring, the gear frame is completed on one standard G. & L. equipped with a rotary table.

Only one setting of the awkward frame in a simple holding fixture is required. The complete assembly is then indexed easily and quickly. Time-consuming resetting and cumulative error resulting from unnecessary handling is eliminated. Parallelism is maintained and bore diameters are held to .0005"

Milling the trunnion boss of a locomotive gear frame. This same cutter performs all milling operations on the part.

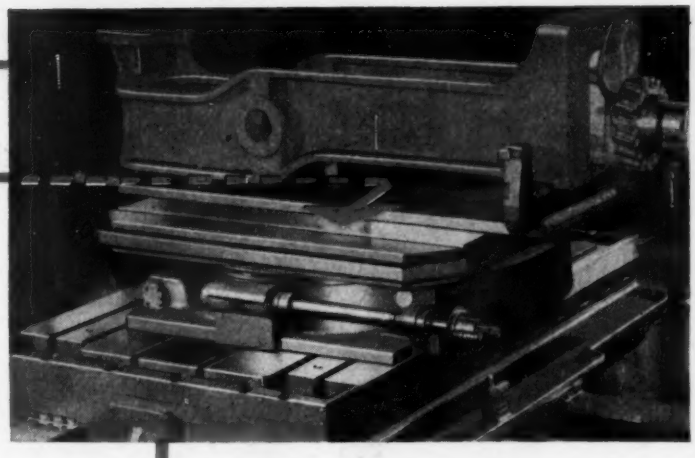


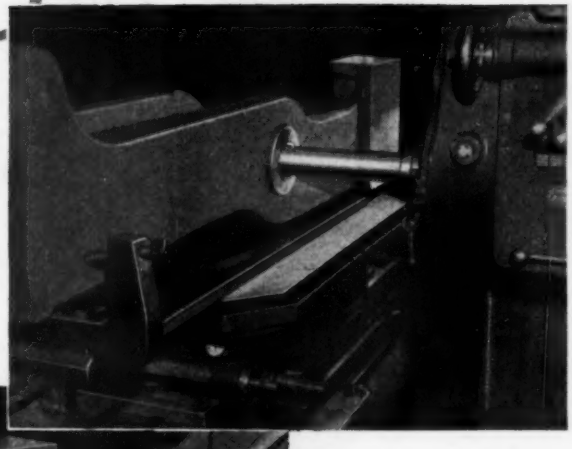
Giddings

22 to 10 HOURS ON THIS VALVE GEAR FRAME

Profitable Advantages
OF A G. & L. ROTARY TABLE

1. ***Simplification of work setting — for table presents work to cutter***
2. ***Rapid and accurate indexing — for repetitive operations***
3. ***Additional working range — for work may be rotated throughout 360°***
4. ***Reduced work handling — for usually only one set-up is required***
5. ***Closer work limits and elimination of cumulative error — because only one work setting is required for several operations***





Rough boring trunnion gear holes. Both bores are made simultaneously. Size and alignment is assured by an internal bar support welded to the holding fixture.

Indexing the rotary table correctly positions this side boss for milling.

HANDLING SIMILAR WORK IN YOUR OWN SHOP

There is a simple and efficient way to handle work of this kind in your own shop on a Giddings & Lewis machine. Experienced G. & L. engineers will work with you to solve your difficult machining problems. Take advantage of correct machine and accessories recommendations now. There is no obligation.

FIELD PERFORMANCE FACTS
Free!
showing how G. & L. machines are profitably used on all types of work. This factual data is conveniently arranged for reference use. Ask for Production Data Folder AM-126.

G & Lewis MACHINE TOOL CO.

138 DOTY STREET ● FOND DU LAC, WISCONSIN

BITS

FOR DRIVING ALL THESE SCREWS

Handle is molded of sturdy Celanese* plastic; tools are of high grade alloy steel.

Contained in this Handle

HALLOWELL

"SOCKET SCREW" KIT

with interchangeable bits

For men who like to have a complete supply of tools, yet dislike bulk and confusion, the Hallowell "Socket Screw" Kit is the answer. It is one of the neatest tricks of the year. The hollow Celanese* plastic handle holds interchangeable bits for most all purposes . . . Phillips, Hex and Flat. There is a swivel bit-chuck, which locks securely in position, and makes it possible to twirl a screw using the vertical position, and then snapping the chuck to an angle or ell position, to get the final tightening pull.

Not illustrated: "Socket Wrench" Kit; the "Auto" Kit; the "Home" Kit. Write for our 8-page booklet that fully describes these handy Tool Kits. Obtainable at Suppliers throughout the country.

If your Supplier does not carry these Kits, send his name to us, along with yours, and you will be taken care of promptly.

Kits: Patents Pending

OVER 43 YEARS IN BUSINESS

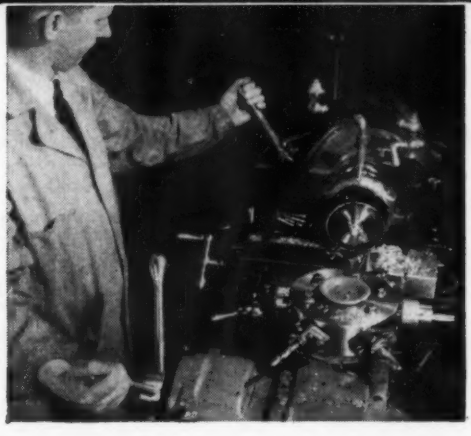
*Reg. U. S. Pat. Off.

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX 4 • BRANCHES: BOSTON • CHICAGO • DETROIT • INDIANAPOLIS • ST. LOUIS • SAN FRANCISCO

ONE LEVER CONTROLS SPINDLE

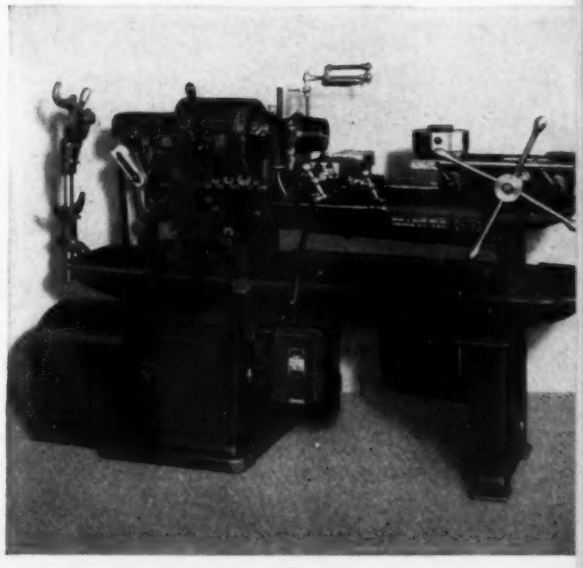
— — Combined spindle clutch and brake concentrates controls for rapid operation on Nos. 0, 1 AND 2 WIRE FEED SCREW MACHINES



Illustrations show operating positions of the spindle clutch lever. Low speeds and high speeds can be run opposite or in the same direction, depending on the work.

SIMPLE
CONVENIENT

Brake applied by easy pull on lever facilitates measurement of work and insertion of pieces into chuck for second operations---remains **on** until lever is manually returned to neutral.



★ No. 0 Machine takes stock to ⅜" diameter (⅝" for light work).
★ No. 1 Machine takes stock to ⅝" diameter. (⅞" for light work).
★ No. 2 Machine (shown) takes stock to 1" diameter (1¼" for light work).

Ask for Booklet giving details

BROWN & SHARPE MFG. CO.
Providence 1, R. I., U. S. A.

BROWN & SHARPE

ARMSTRONG

More ARMSTRONG TOOL HOLDERS for *More* Profit

Whenever you tool a new operation with the correct ARMSTRONG TOOL HOLDER, you increase your profit. Each has the extra efficiency resulting from over 50 years of continuous development and refinement in designs; the extra strength resulting from modern metallurgy and manufacturing methods.

With ARMSTRONG TOOL HOLDERS you can take advantage of the new high speeds and heavier feeds of the newer cutting materials, without revolutionary changes or costly experimentation. They are the most profitable tools obtainable; the lowest in initial cost, the longest in service and most economical in use, for all incorporate the basic Armstrong Principle of small interchangeable cutter-bits in permanent drop forged shanks. They are the most readily obtainable tools too, for they are stocked by all leading distributors.

With emergencies, restrictions and controls passing, now is the time to tool up for normal business with more ARMSTRONG TOOL HOLDERS, for more profit.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

315 N. FRANCISCO AVE. CHICAGO 12, U.S.A.

Eastern Whse. & Sales Office: 199 Lafayette St., New York 12, N. Y.
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NO JIGS NEEDED

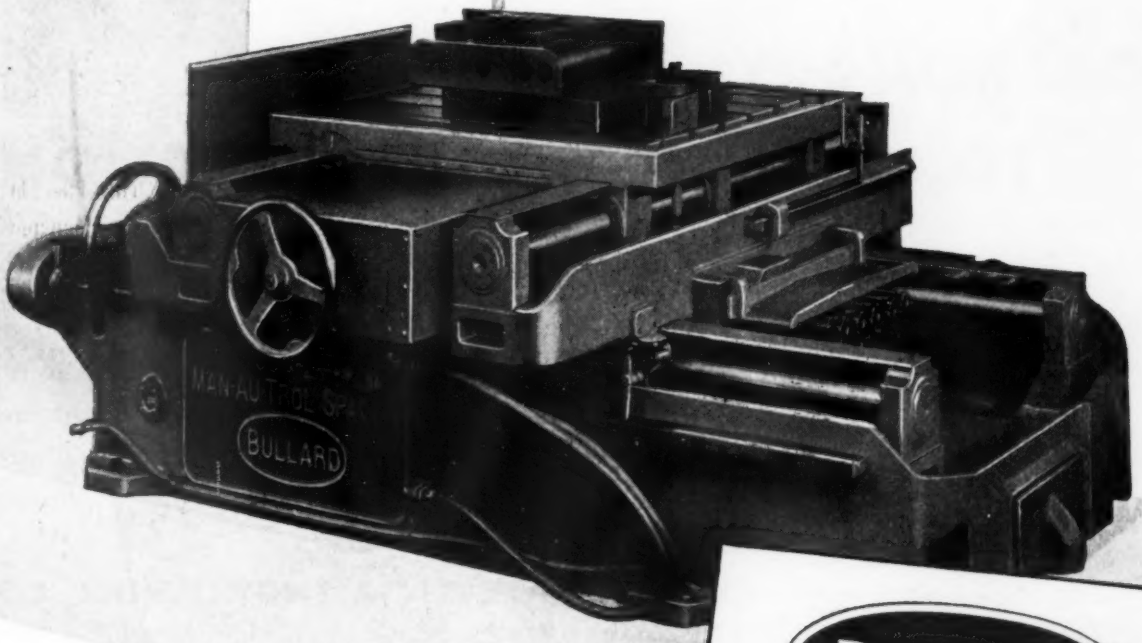
for drilling, boring, reaming and tapping

NEW Bullard MAN-AU-TROL Spacer Increases Speed and Reduces Cost of Drilling Operations

Now . . . with Bullard MAN-AU-TROL Spacers installed on your drills . . . you can start drilling, boring, reaming or tapping just as soon as your engineering drawings are ready.

Working from a master chart, the operator quickly, easily and accurately sets lateral and longitudinal position stops to match the specified pattern of holes. Then, the manually activated Spacer automatically repeats that pattern so that the holes are held *to the highest standard of commercial spacing accuracy*. Easy change-over from job to job and adaptability to an endless variety of work sizes and shapes makes the Spacer ideal for diversified shop schedules.

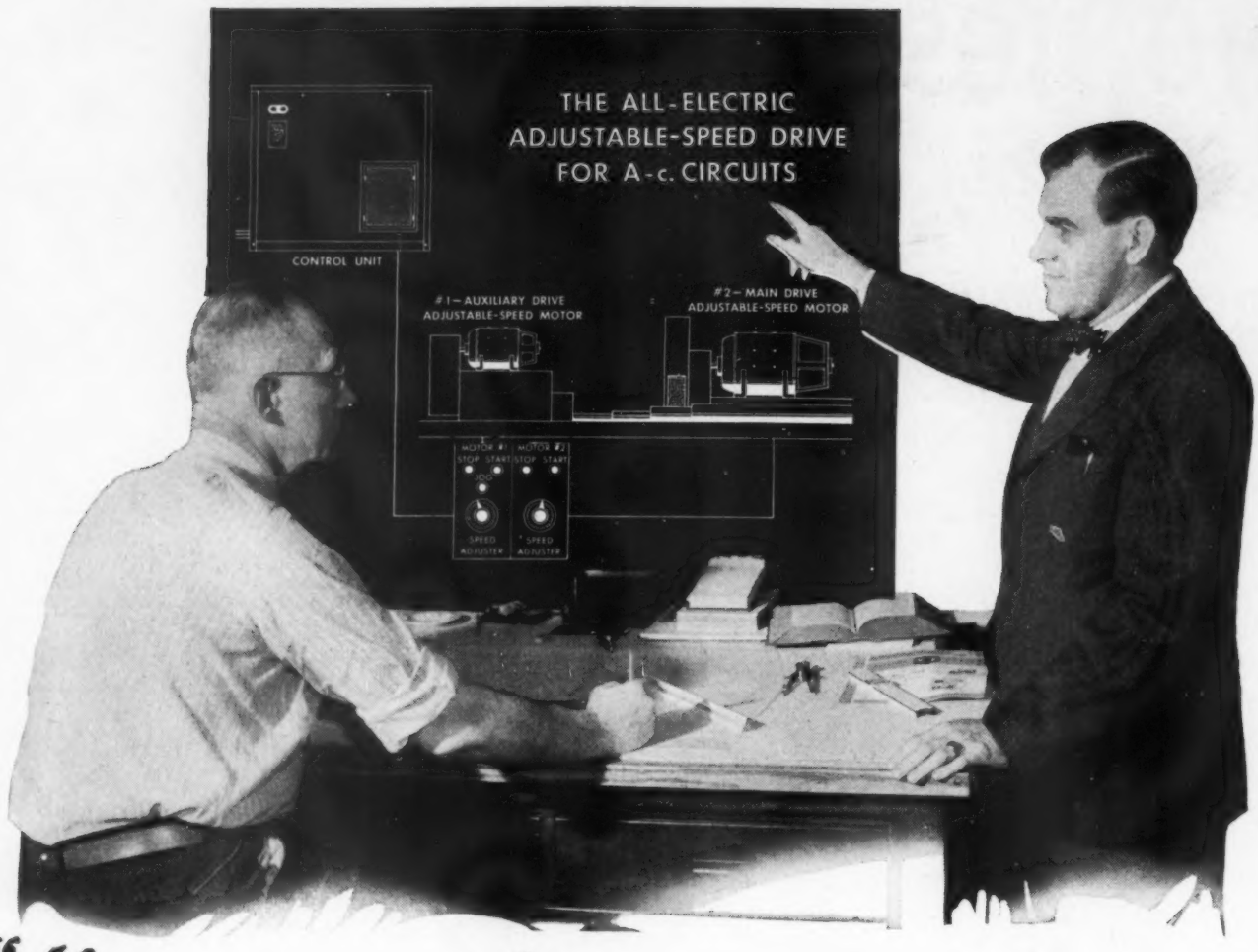
Consider the time, money and labor you will save when Bullard MAN-AU-TROL Spacers eliminate the need for designing, making, handling, repairing and storing hole-locating jigs. Write for MAN-AU-TROL Spacer Bulletin. The Bullard Company, Bridgeport 2, Connecticut.



Made in two sizes—30″ x 20″ (typical installation illustrated here) for larger work on 4′, 5′ and 6′ Radial Drills, and 4″ x 4″ for smaller work usually done on sensitive drills.

BULLARD

CREATES *NEW METHODS* TO MAKE MACHINES DO MORE



"Here's your Answer

TO UNLIMITED SPEED SELECTION!"

RELIANCE V★S DRIVE

Conveniently-packaged, space-saving V★S Drives are available from 1 to 200 horsepower

Reliance V★S is the *All-electric, Adjustable-speed Drive,* which operates from *A-c. Circuits.* The flexibility it brings to machine operations can increase your production and cut your costs—as it has already done in thousands of installations. Here is the simplest, most efficient means of securing an infinite range of stepless speed changes from your plant's A-c. circuit for all processing jobs. Bulletin 311 will bring you more of the important facts about the V★S Drive. Write for it today!

RELIANCE ELECTRIC & ENGINEERING CO.

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Appleton, Wis. • Birmingham • Boston • Buffalo • Chicago • Cincinnati • Denver • Detroit • Gary • Grand Rapids • Greenville Houston • Kansas City • Knoxville • Los Angeles • Milwaukee • Minneapolis • New Orleans • New York • Pittsburgh Portland, Ore. • Rockford • St. Louis • San Francisco • Seattle • Syracuse • Tampa • Tulsa • Washington, D. C. Sao Paulo, Brazil

RELIANCE A-C D-C MOTORS

"Motor-Drive is More Than Power"

THE TOOL YOU WANT . . .

Instantly

Continental **CUTTING TOOLS**

- Boring Bars and Tools
- Broaches
- Broach Pullers
- Broaching Fixtures
- Core Drills
- Counterbores and Countersinks
- CTW Drive Holders
- Counterbores (Tool Room Sets)
- Counterbore Pilots
- Inserted Blade Cutters
- Carbide Tipped Cutters
- Form Relieved Cutters
- Milling Cutters
- Thread Milling Cutters
- End Mills
- Side Mills
- High Speed Steel Reamers
- Carbide Tipped Reamers
- Shell Reamers
- Inverted Spotfacers
- High Speed Steel Tool Bits
- Carbide Tipped Tool Bits
- Circular Form Tools
- Cut-off Tools
- Flat Form Tools
- Dovetail Form Tools

CTW

With Continental Indestructible Drive

CONTINENTAL counterbores, countersinks, core drills (with interchangeable tips) and back spot facers—all with the indestructible Continental drive—have successfully met the exacting requirements of industry for many years . . . Holders are available for both Continental hand detachable and tapered drives, in standard and hand adjustable types and with floating drives . . . Prompt delivery can be made of standard items and special tools to your plant. Available in high speed steel and carbide tipped. Write for Bulletin 11081.

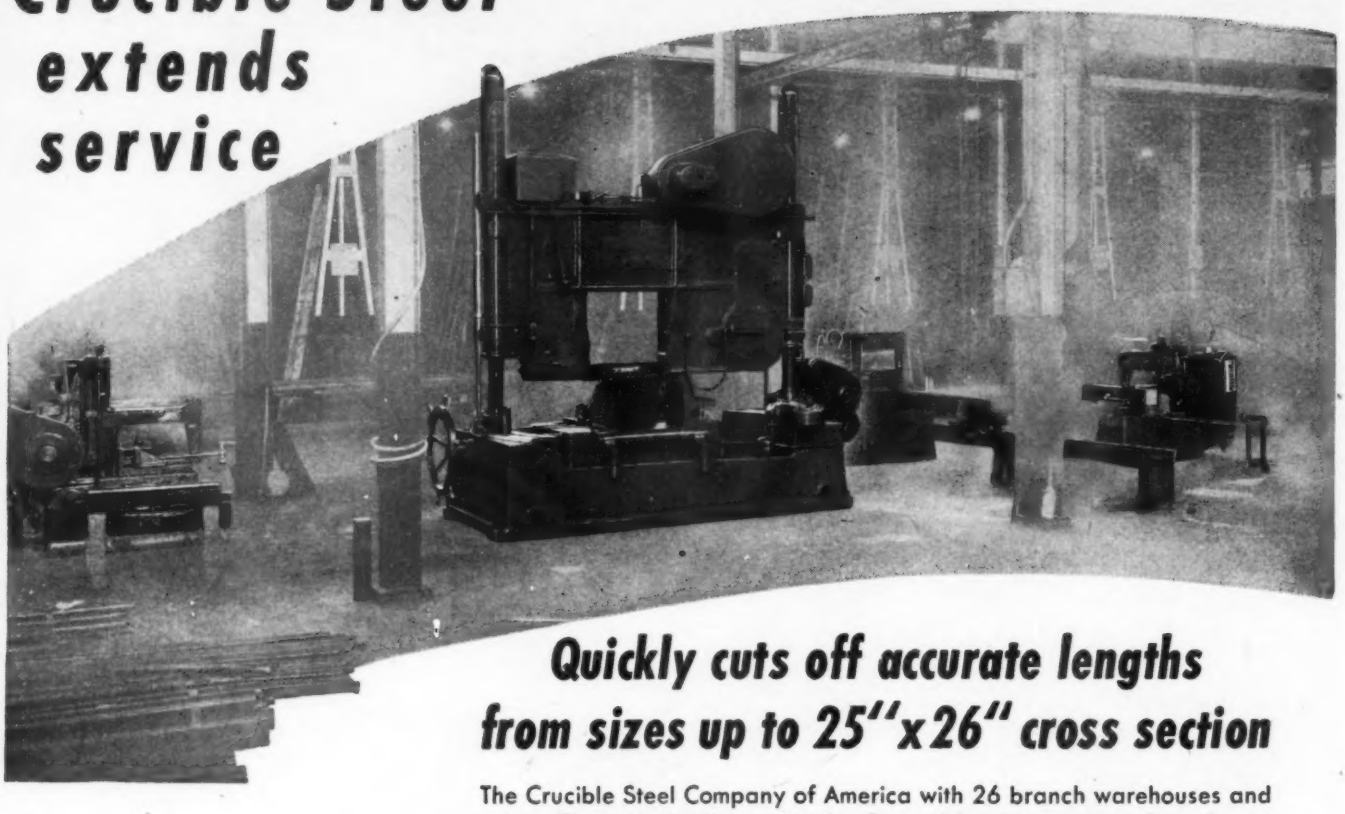
CONTINENTAL TOOL WORKS

DIVISION OF EX-CELL-O CORPORATION

DETROIT 6, MICHIGAN

48—118

Crucible Steel extends service



Quickly cuts off accurate lengths from sizes up to 25"x26" cross section

The Crucible Steel Company of America with 26 branch warehouses and sales offices, has built a reputation for anticipating customers' needs, not only in high grade and special steels, but in service requirements as well. They were among the first to equip several of their warehouses with modern high speed MARVEL Saws (No. 6 and 9A series) in order to give fast service on either single lengths or large quantities of identical pieces, accurately cut from bars up to 10" x 10" cross section. Now in anticipation of new demands for larger sizes, they are the first steel company to install a No. 24 MARVEL Hydraulic Hack Saw in order to give fast service on orders for steels of any type *in sizes up to* 25" x 26" cross section.

This giant hack saw, which almost qualified as a "secret weapon" because it contributed so materially to our production capacity in building naval ordnance, applies an entirely new principle of reciprocation that has made "hacksawing" of large work practical for the first time.

Whatever your metal sawing problems, there is a MARVEL Saw exactly suited to your needs. A MARVEL field engineer will be glad to go over your metal sawing problems with you.

No. 24 MARVEL giant Hydraulic Hack Saw. (capacity 24" x 24"). Employs new "Roll Stroke" sawing action and trouble-free low pressure hydraulic control.

No. 9A MARVEL Production Saw (capacity 10" x 10"). Automatically feeds, measures and cuts-off identical lengths from single or nested bars with no more operator attention than an automatic screw machine.

No. 6 MARVEL Saw (capacity 6" x 6"). A high-speed, heavy-duty, all-ball-bearing saw—operates up to 149 strokes per minute, cuts thru 64% of each stroke, returns in 36%.

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

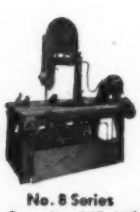
5700 BLOOMINGDALE AVENUE, CHICAGO 39, U.S.A.

No. 1, No. 2 Series
Capacity: 4"x4"
Capacity: 6"x6"

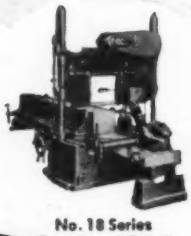
No. 4B Series
Capacity: 6"x6"

No. 6 Series
Capacity: 6"x6"

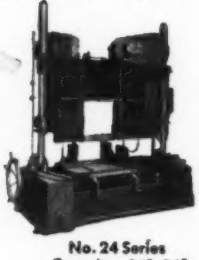
No. 9A Series
Capacity: 10"x10"



No. 8 Series
Capacity: 18"x18"



No. 18 Series
Capacity: 18"x18"



No. 24 Series
Capacity: 24"x24"

MARVEL SAWS

ANNOUNCING

A NEW LORD PRODUCT

Send for *Bulletin 106* for detailed information concerning the MULTIPLANE, and tell us your specific problems in vibration control.

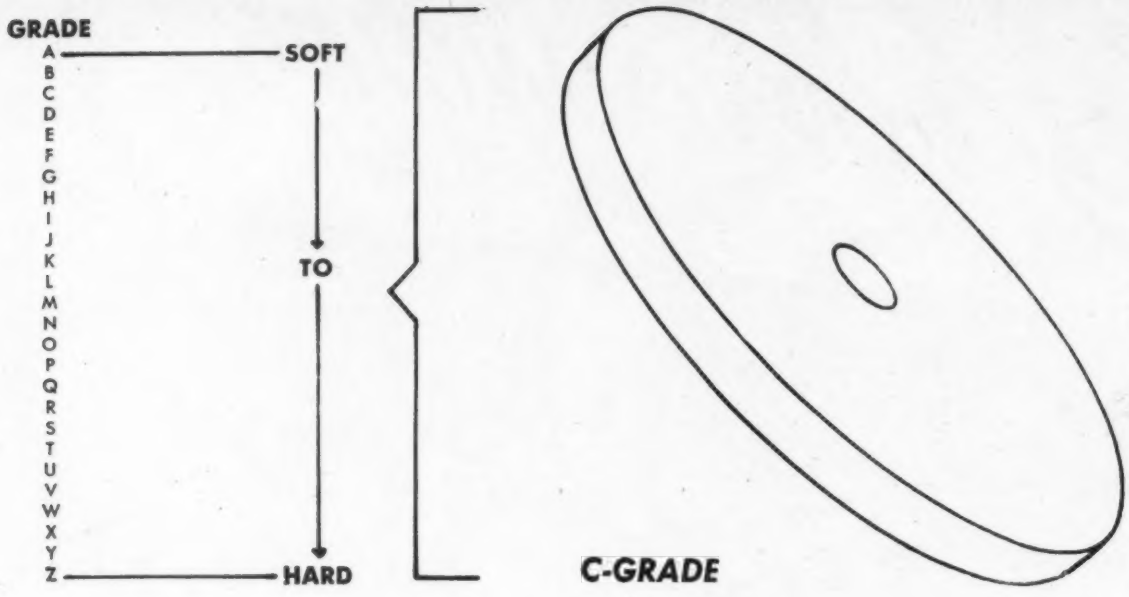
HERE are the new Lord Vibration Control Mountings which isolate destructive vibration, *regardless of the direction of disturbing forces.* They are called MULTIPLANE (many planes) because they are equally soft in all directions. MULTIPLANE Mountings — made in three sizes, four types, and nine load ratings — are easily applied to most light and medium-weight installations. In your efforts to obtain maximum protection for delicate equipment, or to build smoother, quieter machines, you should investigate the new MULTIPLANE Mountings — the latest contribution to product improvement from "Vibration Control Headquarters."

IT TAKES **BONDED RUBBER** *In Shear* **TO ABSORB VIBRATION**

LORD MANUFACTURING COMPANY
ERIE, PENNSYLVANIA

SALES REPRESENTATIVES
NEW YORK - - - 280 MADISON AVE.
CHICAGO - - - 520 N. MICHIGAN AVE.
DETROIT - - - 7310 WOODWARD AVE.
BURBANK, CAL. - 323 E. THIRD STREET
WASHINGTON - 14TH & G STREETS, N. W.
CANADIAN REPRESENTATIVE
[illegible] & POWER ENGINEERING CORP., LTD.
TORONTO, CANADA

Originators of Shear Type Bonded Rubber Mountings



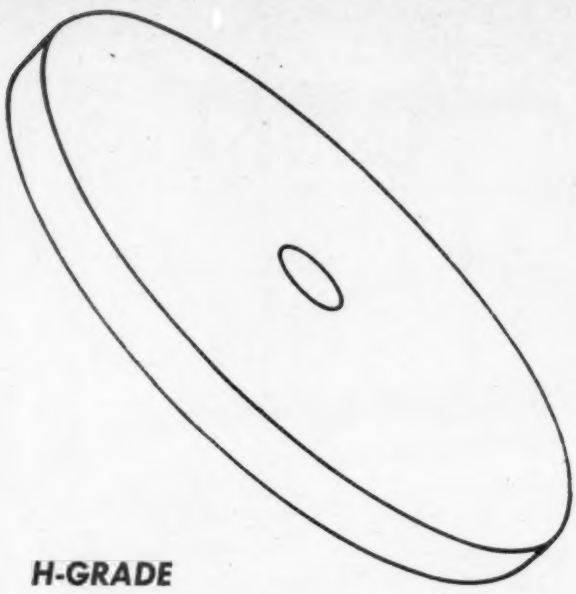
There's more to grinding

The A, B, C's which appear as identification on a grinding wheel help simplify proper grade selection. By clearly showing relative hardness, they make your choice quicker, easier...aid in assuring the right grade for the job. That's one reason wheels by CARBORUNDUM are plainly marked. But, there's more to it than the old chestnut, "the softer the metal, the harder the wheel." It's not that easy.

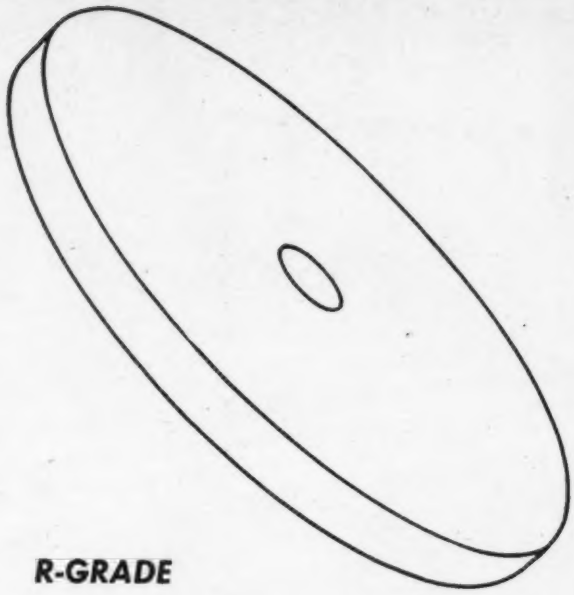
The same grade reacts differently at various wheel speeds. The condition of the machine and the amount of vibration can make a difference. Desired finish...required tolerance must be considered. Coolant conditions vary. The actual type of operation—snagging, surfacing, internal grinding or whatever it is—influences practical selection.

Yes—there are many important factors to check before you can be sure of the right grade designation for the job.

A good rule for good grinding... **CALL**



H-GRADE



R-GRADE

grades than the A, B, C's

That's why we suggest consulting your CARBORUNDUM salesman or our distributor's representative. These men work throughout the year on a wide variety of grinding problems. They are familiar with grinding in production...in tool rooms... wherever it is used. They have practical knowledge and experience to help you pick exactly the wheel you need for the job.

Assisting these representatives in the field are our Abrasive Engineers. Specialized experts, they are equipped to analyze uncommon problems...recommend sound solutions. And, here in our modern laboratories are scientists and technicians who are working on the application of abrasive developments to changing grinding practices.

This *three way* service is easy to use. Just plan to talk "grinding" soon with your CARBORUNDUM representative. He'll be glad to assist you. The Carborundum Company, Niagara Falls, New York.

IN CARBORUNDUM

TRADE | MARK

ABRASIVE WHEELS

Silicon Carbide
Aluminum Oxide
Diamond

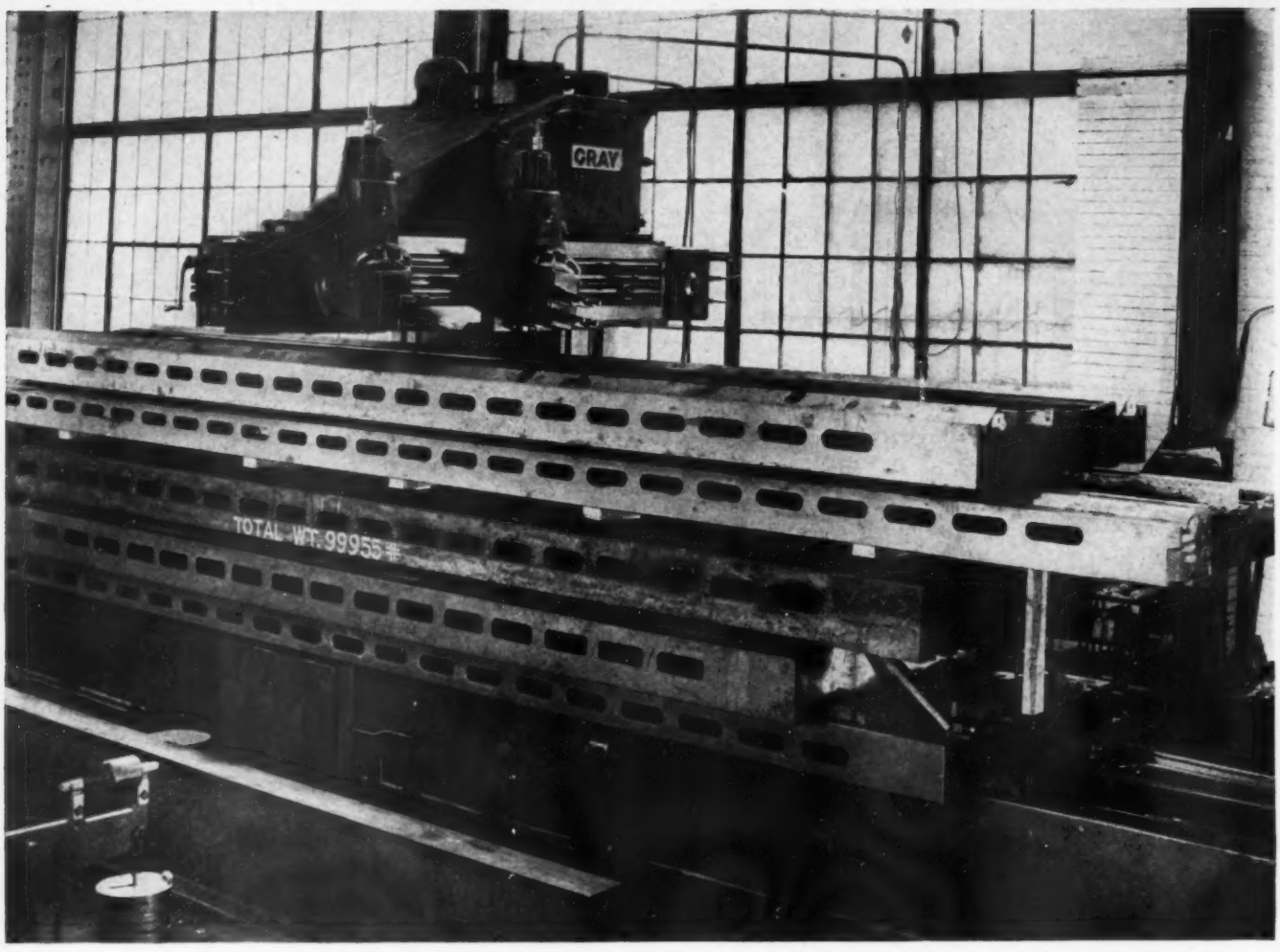
COATED AND BONDED ABRASIVES

Paper and Cloth Combination
Sheets, Rolls, Discs
Cylinder Hones
Sticks, Stones & Rubs
Specialties

ABRASIVE GRAINS AND COMPOUNDS

for:
Polishing
Lapping
Pressure Blasting
Finishing

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company



50 Tons on a 48" x 20' Openside!

JUST ONE OF THE GRUELING TESTS TO WHICH WE SUBJECTED THE

GRAY NON-METALLIC TABLE WAYS*

BEFORE WE WERE SATISFIED TO PIONEER THEIR USE

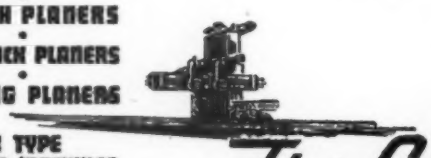
REMEMBER—

A machine tool is no better than its ways. There is no adequate substitute for the Gray non-metallic table ways*.

DOUBLE HOUSING and OPENSIDE PLANERS
•
SWITCH PLANERS
•
DIE BLOCK PLANERS
•
MILLING PLANERS
•
PLANER TYPE MILLING MACHINES
•
HORIZONTAL BORING MACHINES

Gray has been a leader for over sixty years, but no untried construction or materials are ever recommended—all are first given exhaustive, practical shop tests, such as the one illustrated above.

*Protected by patent #2,378,343 and patent pending.



The G.A. GRAY Co.

CINCINNATI 7, OHIO, U. S. A.

You Can COUNT ON VEEDER-ROOT to Build "COUNTROL" into Your Product or Process

. . . with either Standard or Special Veeder-Root Counting Devices

Take a rolling mill, a machine tool, jet plane, juke box — or what have *you?* Odds are long that there's a place ready and waiting, *though perhaps as yet undiscovered*, for Veeder-Root *Count*rol in your product-design and sales-promotion plans.

And now's the time to find out. Ask a "Counting House" engineer to count up the ways in which you can profit by building into your product or process the right Veeder-Root Device (standard or special) . . . like, for one instance, the standard Medium Size Rotary Ratchet Counter shown above.

Remember, too, that *Count*rol can profit your customers as well as yourself . . . can help to keep you on friendly terms by proving your product's guarantee. Find out just how much you *can* count on. Write today to Veeder-Root Inc., Hartford 2, Conn. *In Canada:* Veeder-Root of Canada, Ltd., 955 St. James St., Montreal 3. *In England:* Veeder-Root Ltd., Dickinson Works, 20 Purley Way, Croydon, Surrey.

Give your product this extra Merchandising Feature

We certainly don't expect you to join our growing list of customers *unless* we can give you better abrasive products for *your particular production jobs* . . . plus better service.

Our rapid growth in ten years from one of the smallest makers of abrasive products to one of the largest, didn't just happen. Company after company found we could help them get better production, lower costs . . . and give them better service. That's how we built our business.

Should you use MID-WEST abrasives? The only way we know for finding out is for you to give us a trial. It's worth it . . . if you're looking for better production, lower costs, and better service. Call us. We'll cooperate.

James Jackson
PRESIDENT

MID-WEST ABRASIVE COMPANY

OWOSSO, MICH. DETROIT ROCHESTER, PA.

GRINDING WHEELS HONING STONES COATED ABRASIVES

Sterling

"The Wheels Of Industry"

• A complete listing of the correct Sterling Wheels for toolroom grinding jobs is available in this interesting folder. Ask for your copy.

Tool and Cutter Sharpening Is Quick and Profitable With Sterling Grinding Wheels

● Today, toolroom grinding demands specialized wheels built to the needs of each individual job. Sterling meets this demand with grinding wheels of proper grain-size and hardness to remove stock quickly and without burning. Literally thousands of tricky toolroom grinding problems have been solved by Sterling's "Wheels of Industry."

Resharpening tools and cutters often means reduced tool and production costs. Specifying Sterling Toolroom Grinding Wheels means quick, clear-cutting action on any alloy, regardless of its toughness.

A Sterling engineer is ready to apply the correct type to your troublesome job. Ask about Sterling Toolroom Grinding Wheels.

• STERLING ABRASIVES •

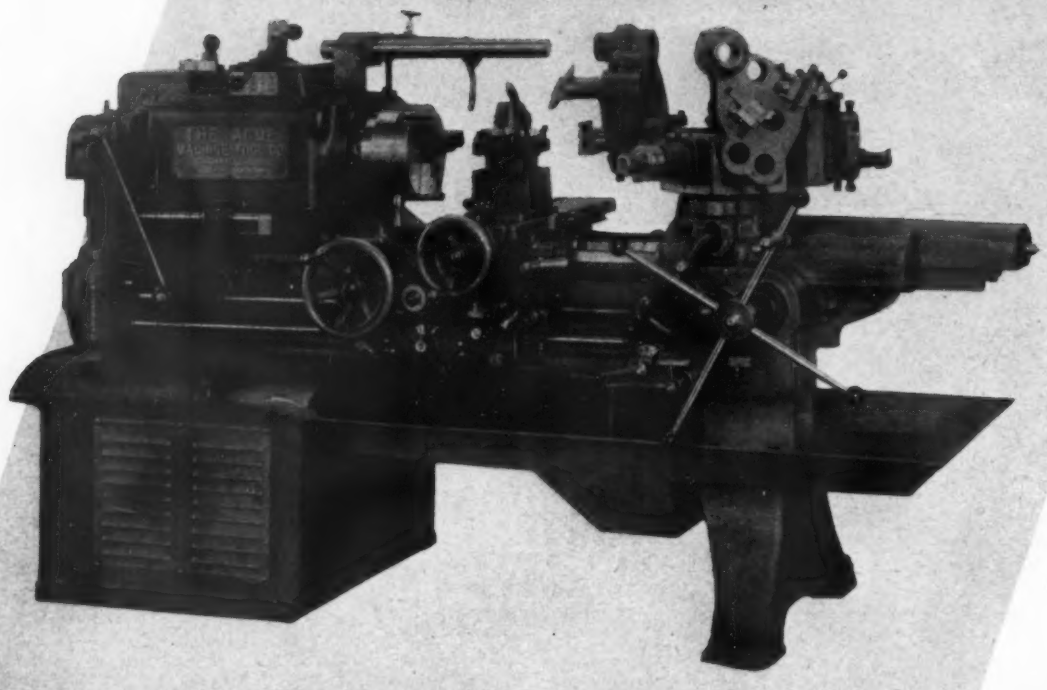
THE STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

ACME features

SIMPLICITY OF CONTROL

EASE OF OPERATION



Cincinnati ACME Universal Turret Lathes have the power and rigidity to stand up over long periods on tough jobs requiring carbide cutting tools—yet ACME simplicity of control and ease of operation enable new operators to become expert on these machines very quickly. They have wide feed and speed ranges for fast, productive cutting and are meeting a great variety of production demands quickly, accurately, economically.

Note these advantages:

Hardened and ground vees mounted on wider centers. Triple roller bearing spindle. Carriage gibbed to both vees, also between carriage apron and lower front side of bed. Heavy, accurately machined main turret and saddle, equipped with powerful clamping mechanism, likewise offer maximum resistance to deflection of heavy, high-speed cutting.

We illustrate the ACME No. 6W (Way Type). Many other types and sizes available.

The ACME MACHINE TOOL Co.
CINCINNATI 32, OHIO

POPE INTERNAL GRINDING SPINDLES

Like These will give you more accurate hole sizes and smoother finishes

This set of four Pope Spindles with *sealed-in* lubrication covers a wide range of sizes and depths of hole grinding.

They all fit in the same machine without changing motor pulley size.

They are representative of the large variety of Pope Precision Internal Grinding Spindle sizes, speeds and shaft extensions that are available.

Ask For Internal Grinding Spindle Bulletin No. 17

No. 37

POPE

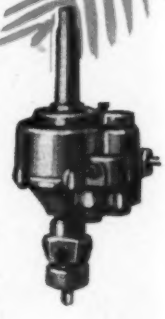
POPE MACHINERY CORPORATION

ESTABLISHED 1920

261 RIVER STREET · HAVERHILL, MASSACHUSETTS

BUILDERS OF PRECISION SPINDLES

SEASON'S GREETINGS and a NEW YEAR OF HAPPY TAPPING



Ettco-Emrick

TAPPING ATTACHMENTS

TROUBLE-FREE tapping for you is more than a **wish** with Ettco-Emrick Attachments. These high-speed, hair-trigger sensitive tappers in the spindles of your drill presses will **give** you fast, accurate tapping—with maximum protection against tap breakage and work spoilage—and at a very modest tool cost. They come in seven sizes for No. 0 to 1" taps. Bulletin No. 2 will give you details. Write for a copy.

ETTCO TOOL CO.

590 JOHNSON AVENUE, BROOKLYN 6, N. Y.
DETROIT 1 • CHICAGO 6

Over 25 years specialization in solving industry's drilling and tapping problems

IT'S EASY TO FIND "FAULTS" WITH THESE INSTRUMENTS!

It's easy to check for the faults in your products with these and other handy G-E testing and measuring instruments. Let them help you. Save time. Save money. Avoid needless waste by keeping an "eagle eye" on the items of your production line. As an added use, make them serve as checks on permanent equipment. Avoid unnecessary breakdowns.

Our engineers will be glad to help you with any particular testing or measuring problems you may have. Just call our nearest office, or write the *Special Products Division, Apparatus Dept., General Electric Co., Schenectady, N. Y.*

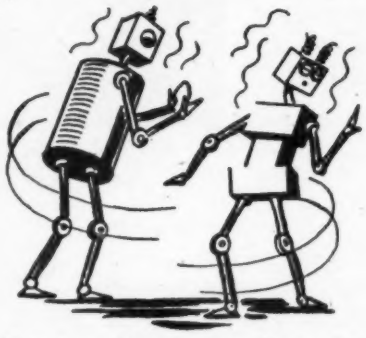
IS YOUR WELDING-MACHINE UP TO PAR?

For checking the performance of resistance welding and for studies in welding research here's a convenient device: the G-E *current-force recorder.* Compact and portable, this equipment records simultaneously a timing wave, the rapidly changing electrode force, and the electrode current of a resistance-welding machine while a weld is being made. It can also be used as a general-purpose amplifier and oscillograph with other types of electric gages for measuring strain, pressure, and other values. For further details, write for Bulletin GEA-4450A.

KNOW YOUR INSULATION FACTS!

To detect insulation faults quickly and easily, enlist the services of a G-E *insulation-resistance meter.* Use it to measure uniformity of insulating materials during the manufacturing process—or on apparatus already installed to indicate the condition of the insulation so that preventive maintenance can be performed promptly. Small, compact, portable. Insulation resistance over a range of 0 to 20,000 megohms can be measured. With this device studies of the effect of temperature and humidity on insulation can also be made. For further information, write for Bulletin GEA-4174.

STOP THOSE MACHINE JITTERS!



Your machinery can have fewer fatigue failures after a check-up with G-E *vibration equipment.* By measuring displacement and velocity of vibration, these instruments will help you to (1) improve product quality, (2) reduce damage to machinery and buildings, and (3) reduce noise. You'll find them accurate and easy to use. Write for Bulletin GEA-4140.

CAN YOUR SHIPPING PACKAGE "TAKE IT"?

Find out with the G-E *puncture tester!* This valuable device provides an accurate measure of the resistance of shipping containers to both puncture and bending. Corrugated board, fibreboard, wall board, thin plywood, heavy paper or liner, vulcanized fibre can all be measured for strength. For full details, send for Bulletin GEA-4168.

HERE'S $100 OF "KNOW HOW"

● Teach the elements of electronics this convenient way . . . with the G-E 12-part talking slide film. A splendid aid in training new technical personnel, in "refreshing" supervisory and production men, and even for teaching non-technical personnel. It comes complete with 12 slide films and records, 300 review books, instructor's manual and carrying case; price of the kit is $100. Call your local G-E office, or order direct from *Apparatus Dept., Section 800-23, General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

General Electric Co., Section B800-32
Schenectady 5, N. Y.

Please send me the bulletins checked below:

- **GEA-4450A—Current-force recorder**
- **GEA-4174—Insulation-resistance meter**
- **GEA-4140—Vibration equipment**
- **GEA-4168—Puncture tester**

Name.....

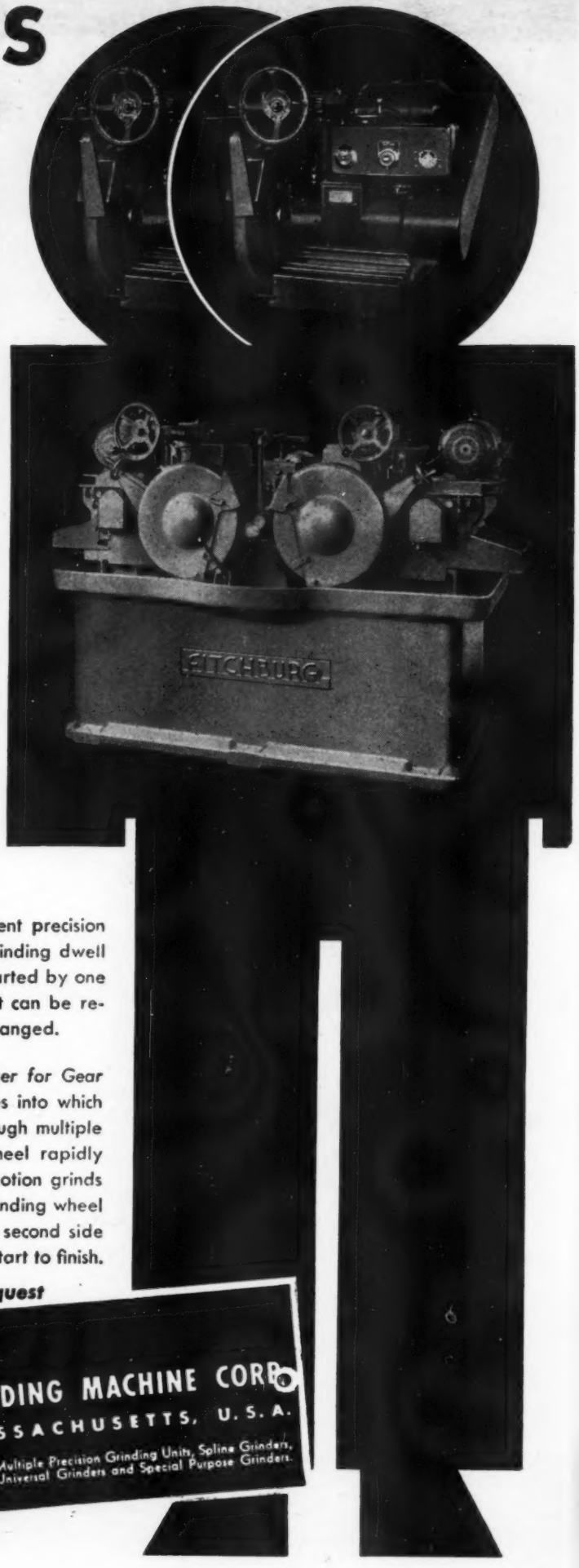
Company.....

Address.....

City.....**State**.....

8851

TWO HEADS ARE BETTER THAN ONE IN MULTIPLE PRECISION GRINDING



When Fitchburg engineers put their heads to the "grindstone" to develop a method that would cut costs on precision grinding as multiple tooling has on machined work, they emerged with a revolutionary idea. This new design not only makes other equipment obsolete — it also prevents its own obsolescence by its unique engineering feature!

The basis of this Fitchburg method is an independent standard interchangeable grinding head which may be mounted singly or in multiples on standard or special equipment, and may be regrouped and remounted on standard machines or on new special bases, for operations other than the one originally specified. Mounted singly, it can perform more jobs than was thought previously possible — straight or bevel gears, internal or external gears, etc. — due to its independent positioning and its ability to be set at any angle the work requires. Mounted in multiples, its production uses are even greater.

THE HEAD. *The Bowgage Head* is a completely independent precision grinding unit. It has rapid traverse, slow grinding feed, grinding dwell or spark out, and rapid return to starting position — all started by one push button. It is precise to .0002", minimizing spoilage. It can be removed and remounted for other work, if operations are changed.

THE BODY. *This Fitchburg Double-Head Grinder and Polisher for Gear Shift Grooves* is typical of many special Fitchburg machines into which independent Fitchburg heads can be built to cut costs through multiple automatic grinding on mass production. One grinding wheel rapidly traverses into the slot and then an automatic side wheel motion grinds one side of the slot, then the other. Meanwhile, the other grinding wheel comes in and finish-polishes the first side ground, then the second side which has just been ground. This is an automatic cycle from start to finish.

Write Today for Catalog—Sent Free Upon Request

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U. S. A.

Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Both Full Universal Grinders and Special Purpose Grinders.

OVER and OVER AGAIN

UNBRAKO

Reg. U. S. Pat. Off.

"Unbrako" Knurled Socket Head Cap Screws are the choice of machinists and engineers—because the knurled head provides a slip and fumble-proof grip—even for the most oily fingers—and the "Unbrako", therefore, can be screwed in faster and farther, before using a wrench.

Machinists and maintenance men specify "Unbrako" Socket Set Screws with the Knurled Cup-Points, because they are SELF-LOCKERS —the points dig in and refuse to budge—regardless of the most chattering vibration.

Write for complete catalog of Famous "Unbrako" Screw Products.

Molded Celanese* Plastics Handles
Kits Patents Pending
* Pat'd. & Pats. Pend.

You can't screw socket screws in or out, without a socket hex wrench—so why not get our #25 or #50 "Hallowell" Hollow Handle Key Kit which contains most all hex bits.

"Unbrako" and "Hallowell" products are sold entirely through distributors.

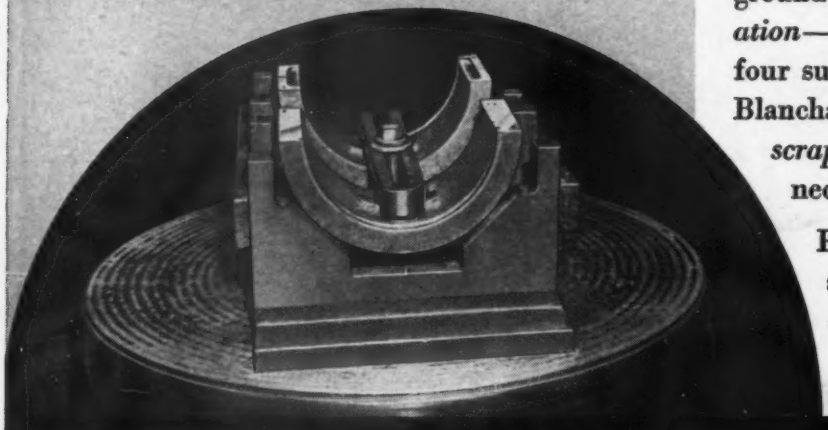
Knurling of Socket Screws originated with "Unbrako" in 1934.

OVER 43 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX 4 • BRANCHES: BOSTON • CHICAGO • DETROIT • INDIANAPOLIS • ST. LOUIS • SAN FRANCISCO

"Put it on the Blanchard"



GRINDING HALVES of TURBINE BEARING

Material: steel and bearing babbit

Size (assembled): 12⅞" O.D., 9¼" I.D., 7⅝" LG.

Held in an inexpensive fixture on the magnetic chuck of a No. 18 Blanchard Surface Grinder, *both halves* of the turbine bearing are finish-ground at the parting joint *in the same operation*—1/64" is removed from each of the four surfaces. The flatness and finish of the Blanchard-ground surfaces are such that *no scraping* or other means of correction is necessary to provide *oil-tight joints.*

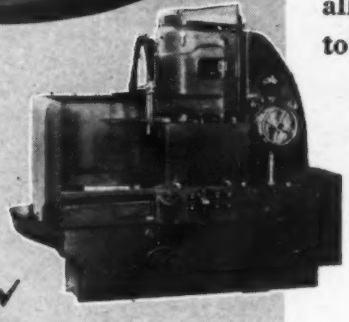
Production is 4 pairs or 8 halves (16 surfaces) per hour. This includes loading and unloading the pieces in the fixture.

The bearing halves are then assembled and held together in a simple clamping fixture. Returned to the Blanchard—*no machine changes are necessary*—both ends of the assembled turbine bearing are finish-ground. (1/64" is removed from each end.) The Blanchard-ground end surfaces are *flat and parallel*, allowing the subsequent finish-boring operation to be registered from either of them.

Production is 8 half bearings (16 surfaces) per hour, which includes assembly and clamping time.

Get These Advantages...

- PRODUCTION ✓
- ADAPTABILITY ✓
- FIXTURE SAVING
- OPERATION SAVING ✓
- MATERIAL SAVING
- CLOSE LIMITS
- FINE FINISH ✓
- FLATNESS ✓



Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

BLANCHARD

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

HARDINGE
ELMIRA, N.Y.

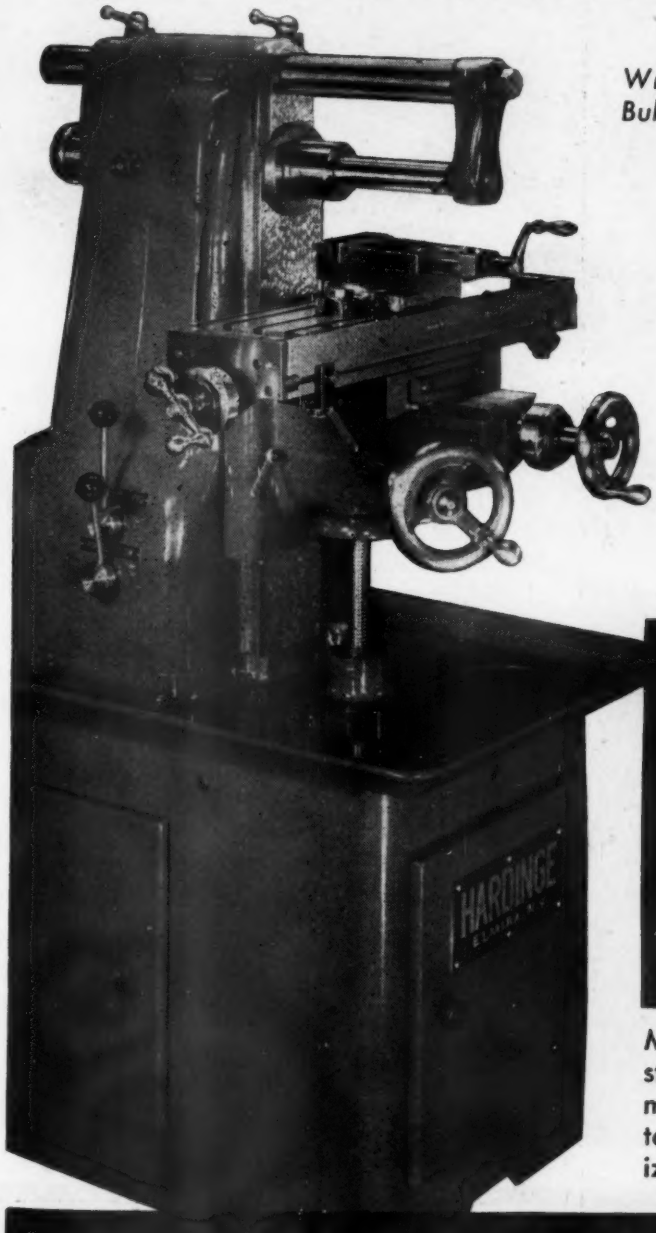
HIGH SPEED PRECISION MILLING MACHINE

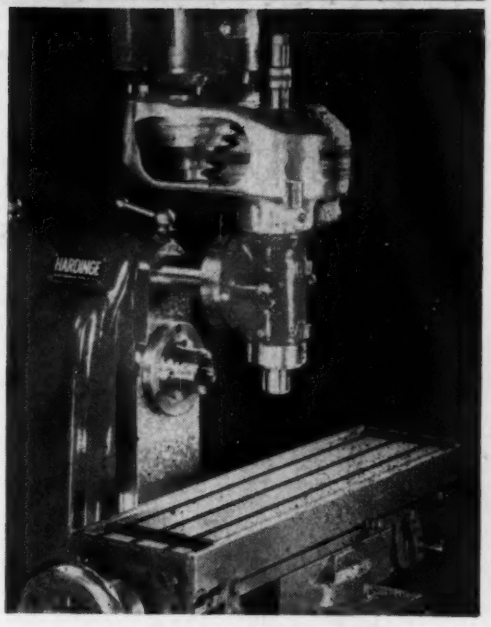
FOR

TOOL ROOM AND LABORATORY

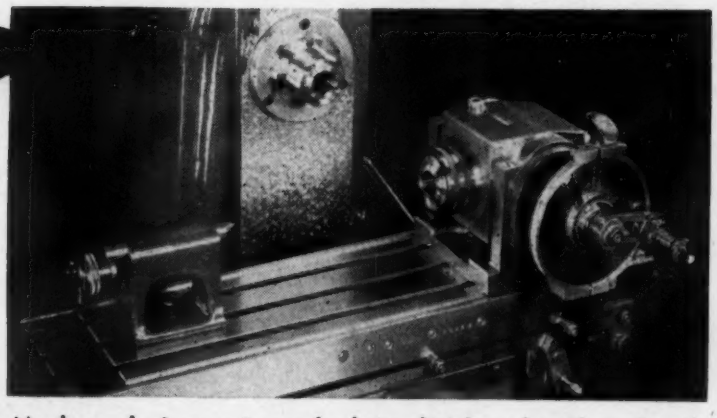
Tool room and laboratory work, because of the variety, demands useful milling machine attachments. Hardinge knows this. Illustrated are two attachments, in addition to the arbor and vise shown below. Other attachments are: Power feed for table; oil coolant facilities; 360° swivel base, also right angle base for dividing head; taper hole collets, as well as regular collets; step chucks and jaw chucks for dividing head.

Write for Bulletin TM-UM





This attachment provides high speed vertical milling. Has separate motor driven preloaded ball bearing spindle —eight selective speeds from 465 to 4250 r.p.m. — takes standard ½" capacity collets. Vertical head swivels to angular settings.



Modern design universal plain dividing head and tailstock. Designed to match the precision qualities of the machine. Features are: Preloaded ball bearing spindle; takes standard 1" capacity collets same as used in horizontal spindle; and high speed indexing, 4 to 1 ratio.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

The Toolmaker's Choice

FOSDICK JIG BORER

● Whether you operate a tool and die shop or the tool and die department of a production plant you will find Fosdick Jig Borers meet the close tolerances demanded on this type of work—easily—quickly—at low cost.

The twelve speeds in geometrical progression from 60 to 1500 R.P.M. available through a single control lever—the nine feeds from .00125-inch to .010-inch per revolution of spindle also available through a single lever, with direct reading index, provide a wide range of feeds and speeds so essential to the economical operation of a tool room.

On the work shown, the revolving table permits different operations on several holes of various diameters to be handled at one setting —another of the many advantages provided in Fosdick Jig Borers.

In this comparatively low-priced machine, Fosdick offers speed—accuracy—and wide adaptability at a price well within the reach of the small tool shop, as well as the the tool room of larger plants.

★

Consult Fosdick on precision boring, facing, drilling and light milling operations—they can help you. Full descriptive bulletin Fosdick Jig Borer J. B. A. available upon request. Write for yours.

★

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ... OHIO

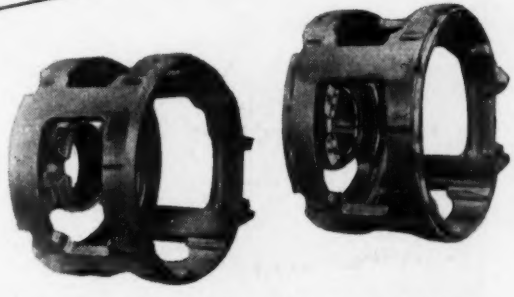
Automatic Feed Changing provides speed and accuracy on the FASTERMATIC

ppose you have a job like this—a fragile generator frame quiring the accurate machining of six different surfaces in e operation at four different feeds, each most suitable for the ecific cut. Here's another case where you can use the versatile stermatic to real advantage.

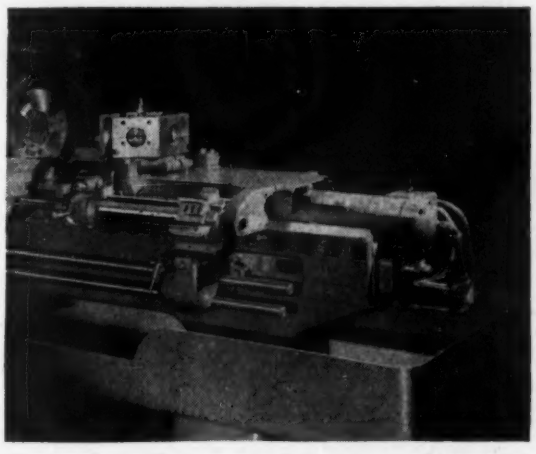
The operator merely loads the machine—quickly and easily—ing spring clamps instead of a chuck to avoid distortion. e Fastermatic does the rest, making the cuts and changing r feeds—*automatically.*

It bores one hole to a tolerance of .0003" and holds all other quired dimensions—thanks to proper cutting speeds and ds. And it does the entire job in only 4½ minutes.

Whether your problem is a delicate part like this, or a rugged ging, you'll find the Fastermatic has the ability to do the —faster, at lower cost. Write for complete information.



Generator frame before and after machining.



This cam drum on the hexagon turret carriage controls the feed for all operations automatically. Adjustment is fast and simple.

ISHOLT MACHINE COMPANY

E. Washington Ave. • Madison 3, Wis.

ok Ahead...Keep Ahead...with Gisholt

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

NOW! ...a 75 H.P. Automatic for BOTH Long and

PERFORMANCE —

The following cutting data reveals powerful possibilities of this new machine:

PART — X-1335 Steel Billet 8" dia. x 40" long
SPEED — 190 RPM — 400 SFM
DEPTH OF CUT — 1"
FEED — .045 per rev.
METAL REMOVED — 183.8 cu. in/min.
HP CONSUMED — 111
RATIO OF HP TO METAL REMOVED— 1.65 cu. in. per HP
TOOL—T. C. Tipped

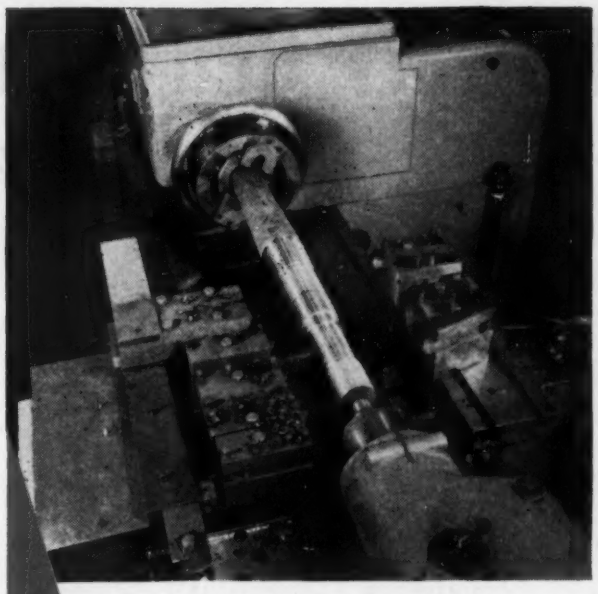
PART—Tractor Steering Clutch Shaft
MATERIAL—N. E. 8749 Steel Forging
HARDNESS — 285 Brinell
OPERATION — Rough Turn, Face and Form Long End
SPEED — 190 RPM (120 to 420 RPM Speed Range of Machine)
FEED — .38
METAL REMOVED — 18 pounds
HP CONSUMED — 79 (max. at peak load)
CYCLE TIME — 60 sec.
TOOLS — (8) T. C. Tipped

PART — Track Sprocket Shaft
MATERIAL — 1045 Steel Forging
HARDNESS — 212 Brinell
OPERATION — Rough Turn, Face and Form One End
SPEED — 229 RPM
FEED—.038 Front Slide, .015 Rear Slide
DEPTH OF CUT — Max. 7/8"
METAL REMOVED — 25 pounds
HP CONSUMED — 84 (max. at peak load)
CYCLE TIME — 75 sec.
TOOLS — (9) T. C. Tipped

SUNDSTRAND MACHINE TOOL CO. ROCKFORD ILLINOIS U.S.A.

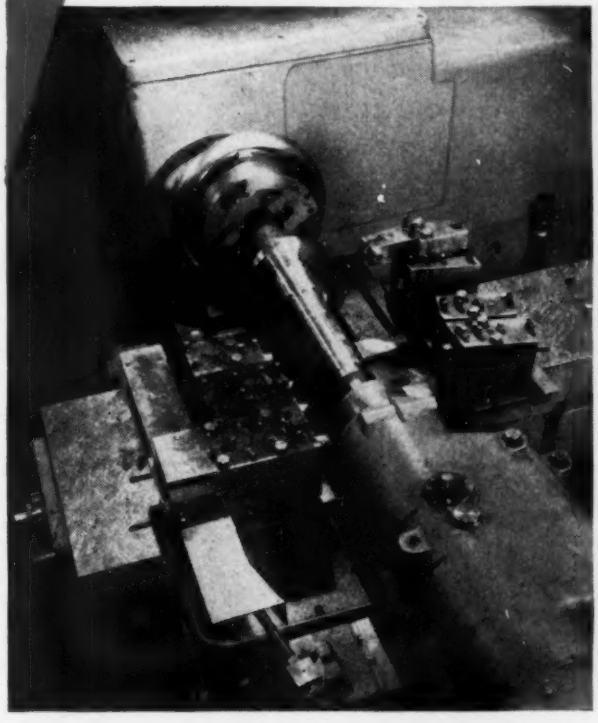
RIGIDMILS | FLUID-SCREW RIGIDMILS | AUTOMATIC LATHES | HYDRAULIC EQUIPMENT

Lathe Short Runs..



Above — Rough turning one end of track sprocket shaft using 9 carbide tipped tools.

Below — Turning tractor steering clutch shaft using 8 carbide tipped tools.



NEW MODEL 16 LATHE HAS ALL SUNDSTRAND LATHE FEATURES WITH 75 H. P. SPINDLE MOTOR..

Yes, this new heavy duty lathe (17" swing over slides) has the same quick cycle change-over features as all other Sundstrand automatic lathes. It also has the same simplicity in adjustments, wide range of carriage cycles, wide range of feeds and speeds, high rapid traverse rate *and* a 75 horsepower spindle motor.

It handles large work as quickly and easily as smaller Sundstrand lathes.

If you have heavy turning jobs in long or short runs, or both, check into this highly productive automatic lathe. Its time saving capabilities can turn costly, cumbersome jobs into profitable ones.

FREE DATA coming off the press

This new booklet will give you specific data on the many outstanding features of this new heavy duty automatic lathe. Specifications, complete cycle data, and description of the Sundstrand quick cycle change-over are all included. Write for your copy today. Ask for bulletin No. 155.

SUNDSTRAND MACHINE TOOL COMPANY

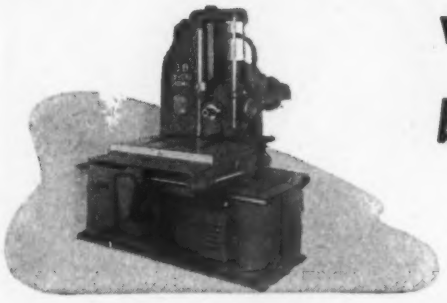
2533 Eleventh St. • Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES | SPECIAL MILLING AND TURNING MACHINES

Retract and Reposition Your Work

within .0002" Selected Location

by Push Button Controls!



3-B DEVLIEG JIGMIL Provides for

Minimum Tool Overhang

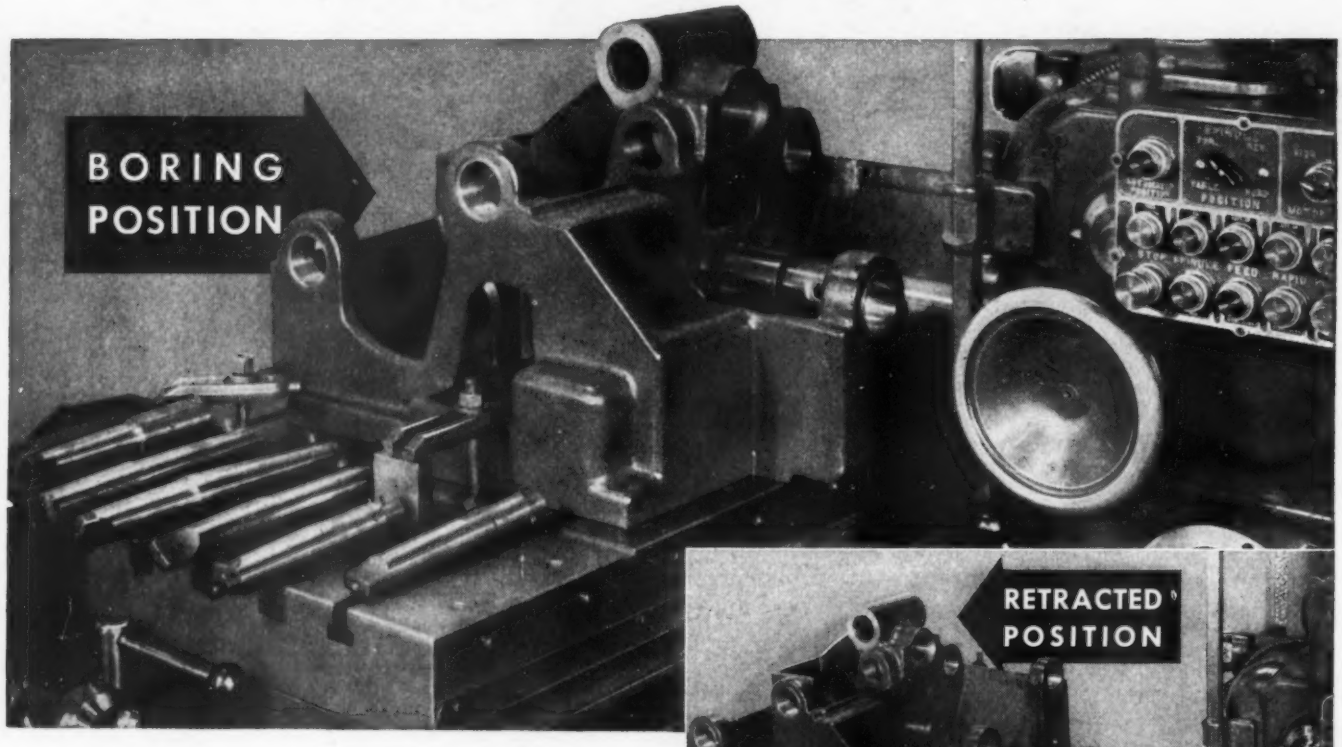
Maximum Operating Efficiency

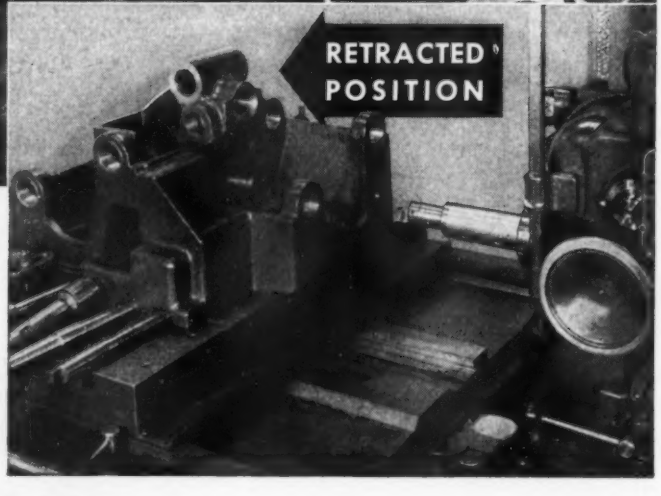
Greater *Controlled* Accuracy

You can save time, cut costs and reach new high standards of accuracy on your difficult precision jig boring and milling operations with a 3-B DeVlieg JIGMIL.

Location of work for minimum tool overhang and top performance advantage! Ready accessibility for necessary tool adjustments and changes! Convenience for checking machined dimensions! All these are served by JIGMIL's centralized push button control means which unlocks and retracts the table to open position, then automatically repositions and locks the table to within .0002" of the selected position.

In addition, JIGMIL's push button controls provide automatic hole spacing accuracy within .0001". Write today for complete descriptive and technical literature.





Here's Precision Boring at its Best!

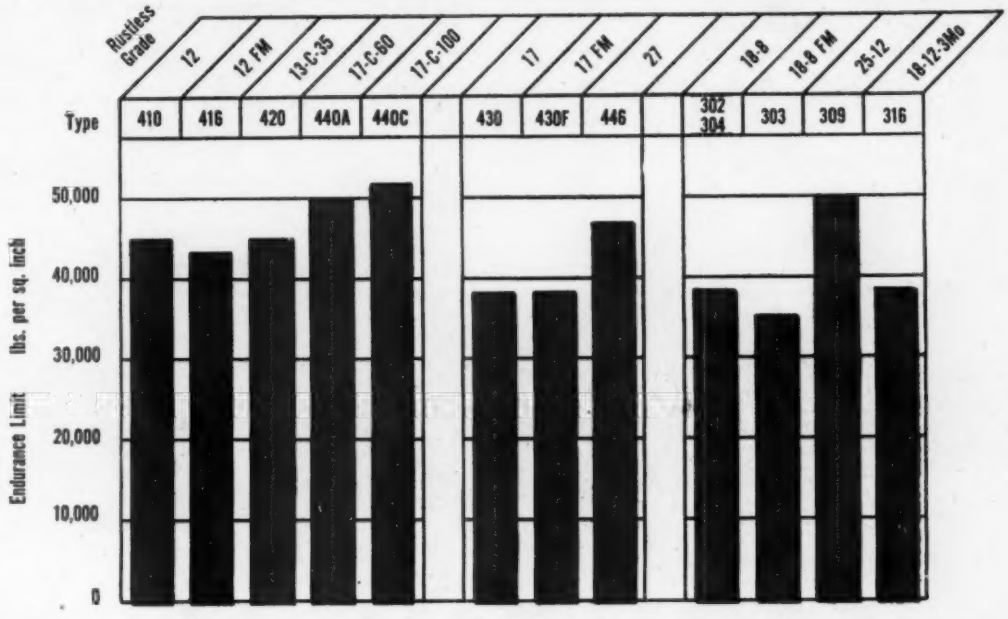
The work piece above is an intricate casting for a three way diamond boring machine. All holes were bored on a 3-B DeVlieg JIGMIL to size, length and spacing accuracies of within .0001". Of the five castings comprising this particular job, the same high JIGMIL standard of accuracy was maintained throughout for perfect interchangeability of parts!

DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

RUSTLESS DATA SHEET NO. 9

Corrosion Resistance Plus Resistance to Fatigue

One of the Many Combinations of Properties Offered by Stainless Steels



METALS get tired. Under many repetitions of stresses metals become fatigued, and are not able to endure loads indicated as safe by the usual static tension and compression tests. When corrosive conditions are severe, this danger is exaggerated, causing a substantial drop in the safe loading stress. Stainless steels, however, show higher endurance limits or resistance to fatigue under many conditions, and will outperform other engineering materials under any number of repeated stress cycles.

Endurance limits have been established to indicate the safe loading stress which a material can withstand under an unlimited number of repeated stress cycles. Endurance limits are used in the design of moving machine parts such as pump shafting, aircraft controls, springs and instrument parts where loads are applied in repeated cycles—from maximum to zero, or from maximum tension to maximum compression. Endurance limits vary for different materials and for different conditions of that material. Endurance limits are closely related to tensile strength and usually approximate one-half the ultimate tensile strength. Therefore, any treatment which alters the tensile strength, also alters the endurance limit. Values of endurance limit indicated in the above chart represent stainless steels in the annealed condition and, therefore, are the minimum values to be expected. Hardening either by cold work or by heat treatment will raise the endurance limit to a considerable extent. Stainless steels not hardenable by heat treatment can be cold worked to obtain endurance limits approaching 100,000 pounds per square inch. Stainless grades hardenable by heat treatment go even higher. Types 420, 440A and 440C, when hardened and stress relieved, offer endurance limits well over 100,000 pounds per square inch—higher than many straight carbon steels, and much higher than any other standard engineering material.

There are many factors which affect fatigue and make it a complex subject. Scratches, machine marks, nicks, dents, and other surface irregularities form stress concentration points and promote the progressive failures which are characteristic of fatigue. Temperature has a pronounced effect on fatigue. Corrosion, in combination with fatigue, has extreme effects usually predictable only by studies of service performance. Fatigue is a subject requiring special attention. When you want to use stainless steel to resist corrosion fatigue, consult our specialists.

Automatic bottling equipment must withstand a severe combination of service conditions, and must be made of material of high fatigue strength—

For a complete report on why one prominent manufacturer uses stainless steels almost exclusively for this purpose, and how the hundreds of different parts are machined to rigid quality standards at high production rates—request a copy of Rustless' latest 3-page case history "Machining Stainless Steels by Preference."

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THE AMERICAN ROLLING MILL COMPANY
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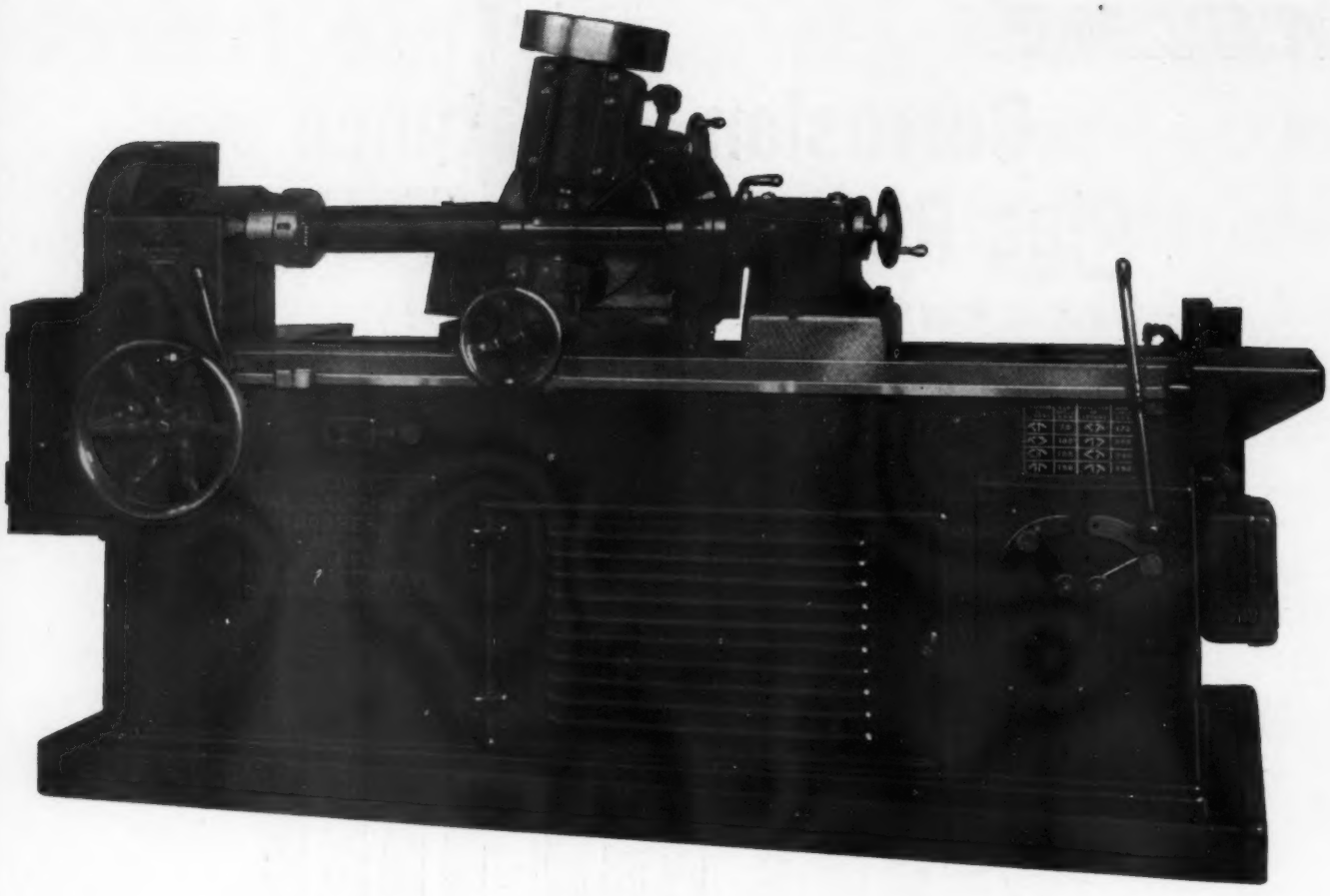
STAINLESS STEEL SPECIALISTS



ECONOMICAL PRODUCTION

ADAMS

Manufacturing Hobber

- **GREAT RIGIDITY**
- **EXTREME PRECISION**
- **UNUSUALLY SIMPLE SETUPS**
- **ADAPTABLE FOR LONG OR SHORT RUNS**

You can depend on this ADAMS Manufacturing Hobber to maintain exceptionally high standards in spur gear and splined shaft hobbing.

This Hobber has great rigidity and it gives you precision results. Made in two sizes. Write for booklet which gives complete details.

ADAMS

THE ADAMS COMPANY
DUBUQUE, IOWA

ESTABLISHED 1883

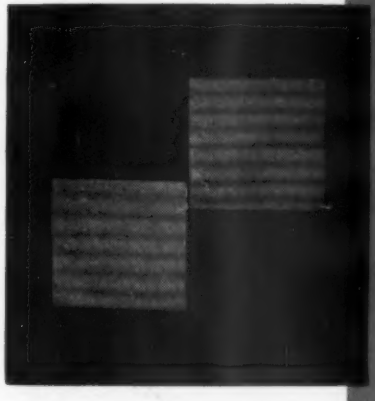
Van Keuren

SOLID SQUARE MASTER BLOCKS

The Ultimate in Design, Workmanship Stamina and Permanent Accuracy

THE LAST MILLIONTH

Light wave bands show that two Van Keuren Solid Square Master Blocks are flat and parallel to the last millionth of an inch. The square design permits this accuracy to be produced and maintained.



Your next set of gage blocks should be something special.
Blocks so hard and dense that they can be lapped only with the diamond.
Blocks so perfectly flat and parallel that they may be calibrated to the last millionth.
Blocks made of steel which will expand and contract similar to the precision steel parts of your new product.
Blocks of a permanence which insures accurate measurement over the years.
Blocks having large well proportioned lasting surfaces which will retain their original perfect flatness and parallelism.
Blocks which are finished true and square on all sides.
Blocks made by craftsmen having over 25 years' experience.
Blocks which will wear 6 times as long as those you have known.
Van Keuren Solid Square Master Blocks have these qualifications. The complete 85 block set sells for $750.00, the 41 block set for $375.00. They will pay for their first cost many times over.

Write for your copy of Handbook and Catalog No. 33 giving complete Specifications of Solid Square Master Blocks and other Van Keuren precision measuring tools.

THE Van Keuren CO.,

27th YEAR

176 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires.

Another HYPRO Exclusive Feature—

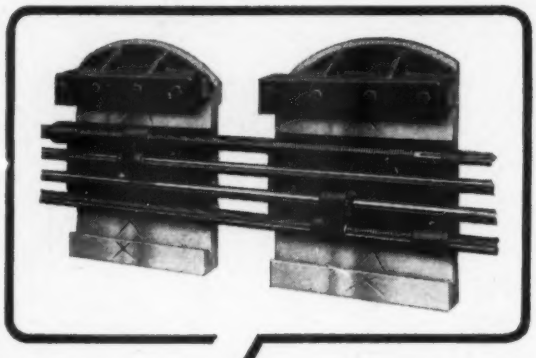
Back Lash Elimination through Double Nut Construction on Cross Feed and Down Feed Screws

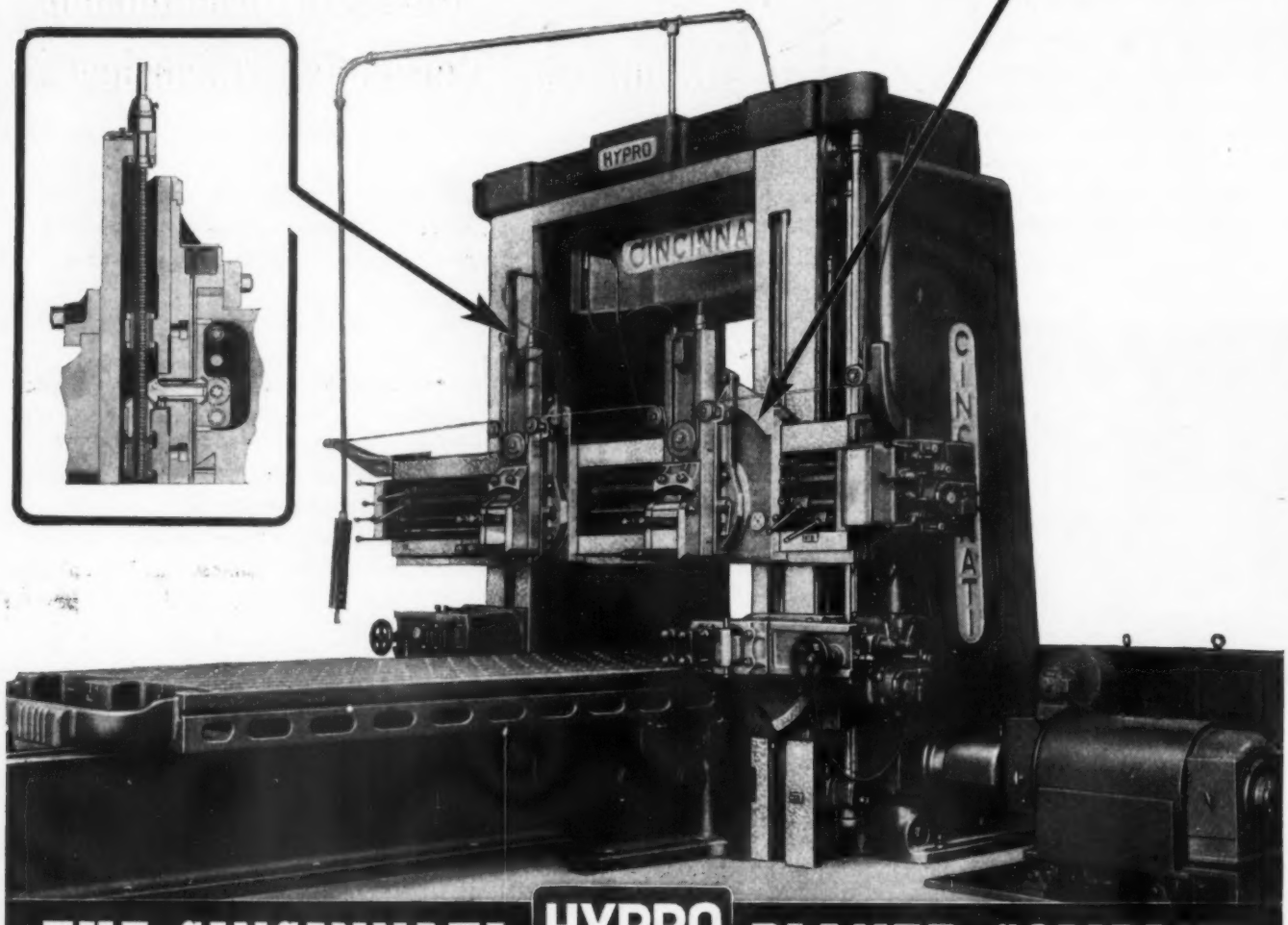
Double nuts made of a special bearing bronze are used on both saddle and down slide screws.

These nuts are held in the saddle and slide nut bearings by retaining nuts so that it is possible to keep the saddle and down slide free of backlash by adjustment of one retaining nut.

This retaining nut is accessible from the edge of the saddle and from the bottom of the rail head slide so that backlash elimination is possible without removal of any part of the head.

Each bronze nut is full length of any conventional single nut construction, thereby dividing the wear.





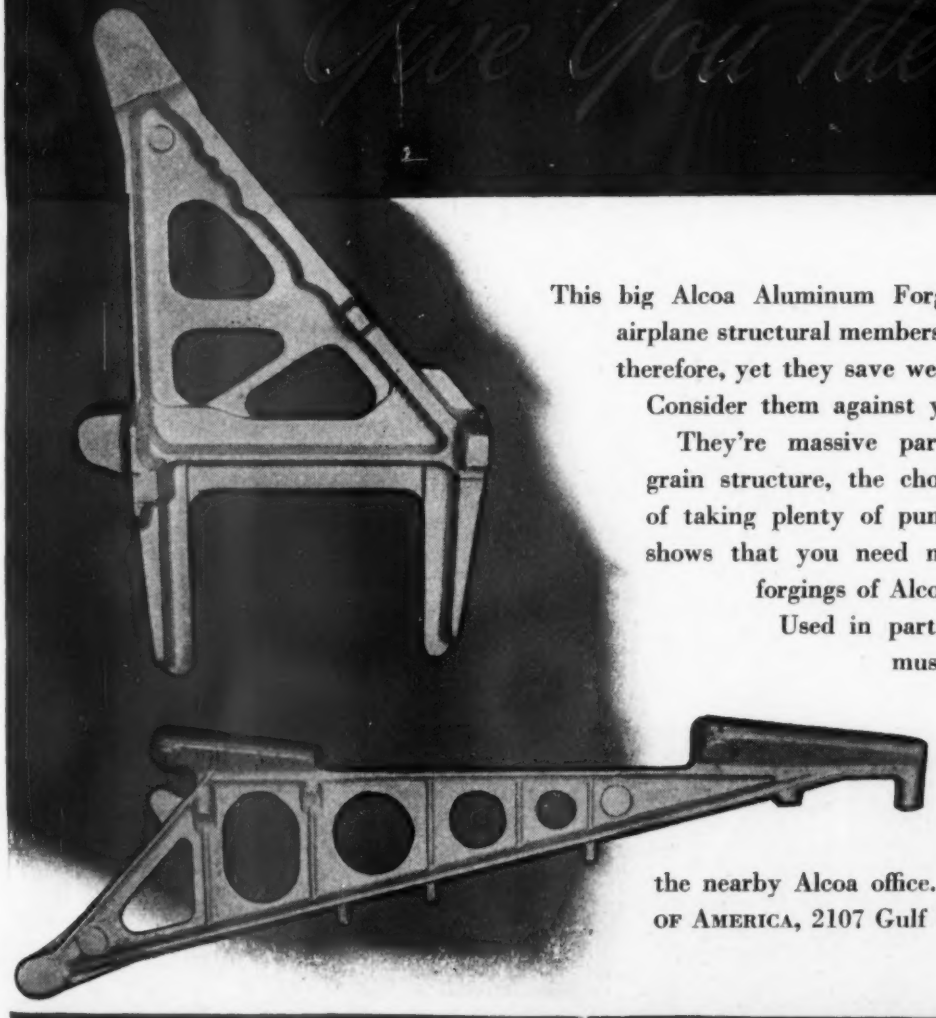
THE CINCINNATI HYPRO PLANER COMPANY

PLANERS · BORING MILLS · PLANER TYPE MILLERS

CINCINNATI, OHIO

DOES THIS 5-FOOT ALUMINUM FORGING

Give You Ideas?



This big Alcoa Aluminum Forging and the smaller pair are airplane structural members. You know they're dependable, therefore, yet they save weight where lightness is essential.

Consider them against your needs—

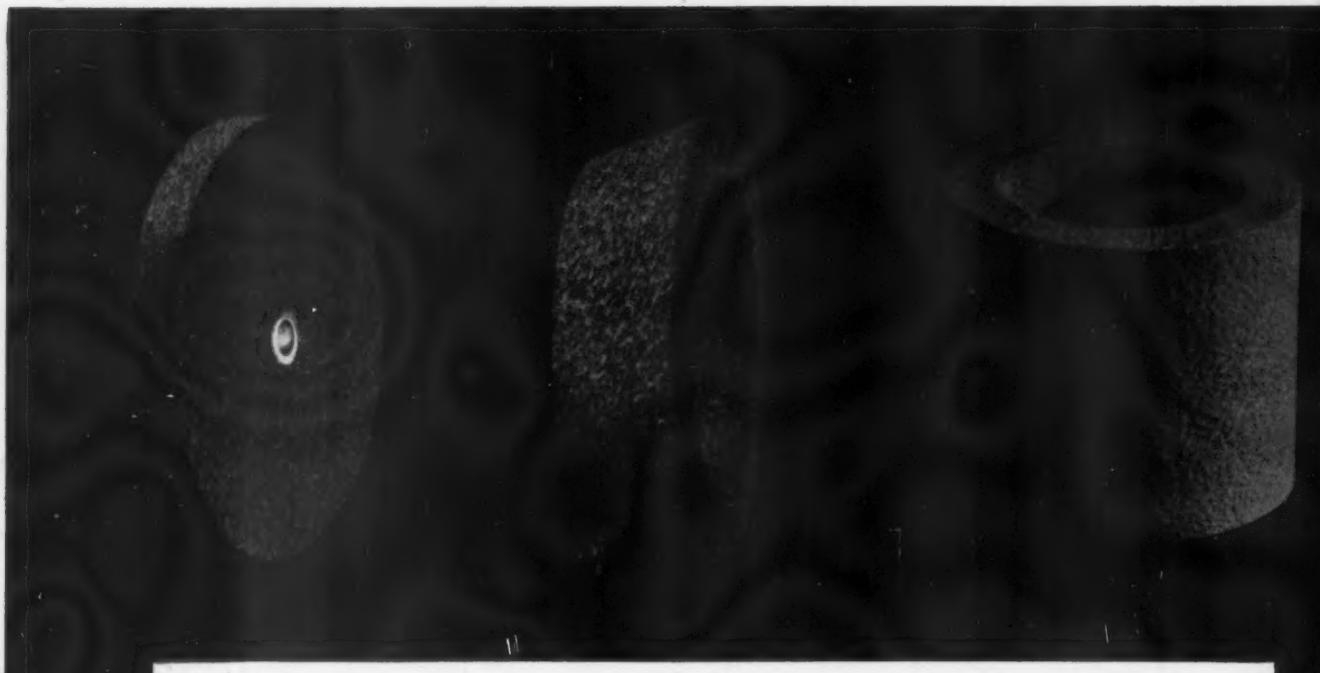
They're massive parts; capable, because of their grain structure, the choice of alloy, and their design, of taking plenty of punishment. Their complex shape shows that you need not feel restricted in designing forgings of Alcoa Aluminum.

Used in parts that move or products that must be moved, Alcoa Aluminum Forgings enable you to reduce dead weight without sacrificing strength or safety. For help in including them in your products, call the nearby Alcoa office. Or write ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Penna.

ALCOA FIRST IN **ALUMINUM**

ALCOA ALUMINUM

IN EVERY COMMERCIAL FORM



Christmas present for your cost department

Would you like to give your cost department a Christmas present of reduced production expenses?

Such reduction might be possible in your grinding operations. Since 1889, men in your industry have often been amazed by cost savings accomplished after shifting to specially built Peninsular grinding wheels.

Similar savings in your plant are probably possible. The best way to find out is to call in Peninsular engineers.

They will study your machines, your grinding methods, and the metals you grind. They will then develop the correct grinding wheels for your particular work.

Every Peninsular grinding wheel is specially made for its particular job.

The Peninsular Grinding Wheel Co., 729 Meldrum Ave., Detroit 7. *Sales Offices:* Chicago, Philadelphia, Boston, Buffalo, Cleveland, Newark, Pittsburgh, Houston, St. Louis, Cincinnati.

PENINSULAR

INDIVIDUALLY PENINSULAR *ENGINEERED*

GRINDING WHEELS

SINCE 1889

SPECIALISTS IN RESINOID BONDED WHEELS

This Christmas tree is really Peninsular tapered cup wheels with a straight wheel top and—for a base, a surface grinding wheel.

THE TOUGHER THE SERVICE THE BETTER THE TEST...

Many small tools are capable of handling easy jobs with a certain degree of efficiency and economy, whereas on the tough job they might not stand the gaff.

Today, most jobs are tough, calling for tough tools. Then too, because of small tool shortage, all tools must sooner or later be assigned to gruelling service making it imperative that every small tool be capable of maximum performance in long, hard work.

The test of UNION TOOLS is to put them to work under today's conditions and let results dictate the tools you buy. On such a basis UNION will be the "Tools You Buy Again."

THE UNION LINE

Twist Drills—Milling Cutters—Reamers—Hobs—Slitting Saws — End Mills — Taps — Dies — Screw Plates—Profile Cutters.

UNION TWIST DRILL COMPANY, ATHOL, MASS.

STORES New York Store: 61 Reade St.; Los Angeles Store: 524 East Fourth St.; Chicago Store: 11 So. Clinton St.; Seattle Store: 568 First Ave., So.; San Francisco Store: 121 Second St.; Detroit Store: 5527 Woodward Ave.

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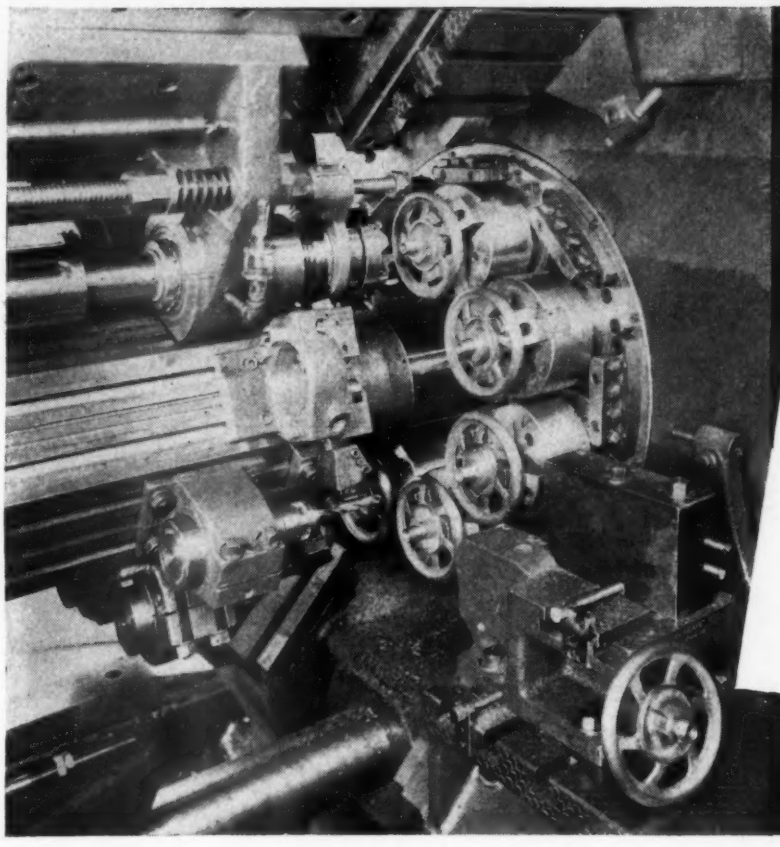
UNION

PRODUCTION MACHINES THAT *Sell Goods*



Example OF MODERN COST CUTTING

This sewing machine hand wheel, of cast iron, requires 16 operations for finishing. The entire job is done on an Acme-Gridley 6″ RPA 8-Spindle Chucker in 44 seconds.

Carbide tipped tools are used for the forming and turning cuts.

Two machines do this job, and fourteen other important jobs, with a simple change of tooling. That's versatility—and economy.

Respect from the Sales Department has been earned, in many a business, by Acme-Gridley 4, 6 and 8 Spindle Bar and Chucking Automatics.

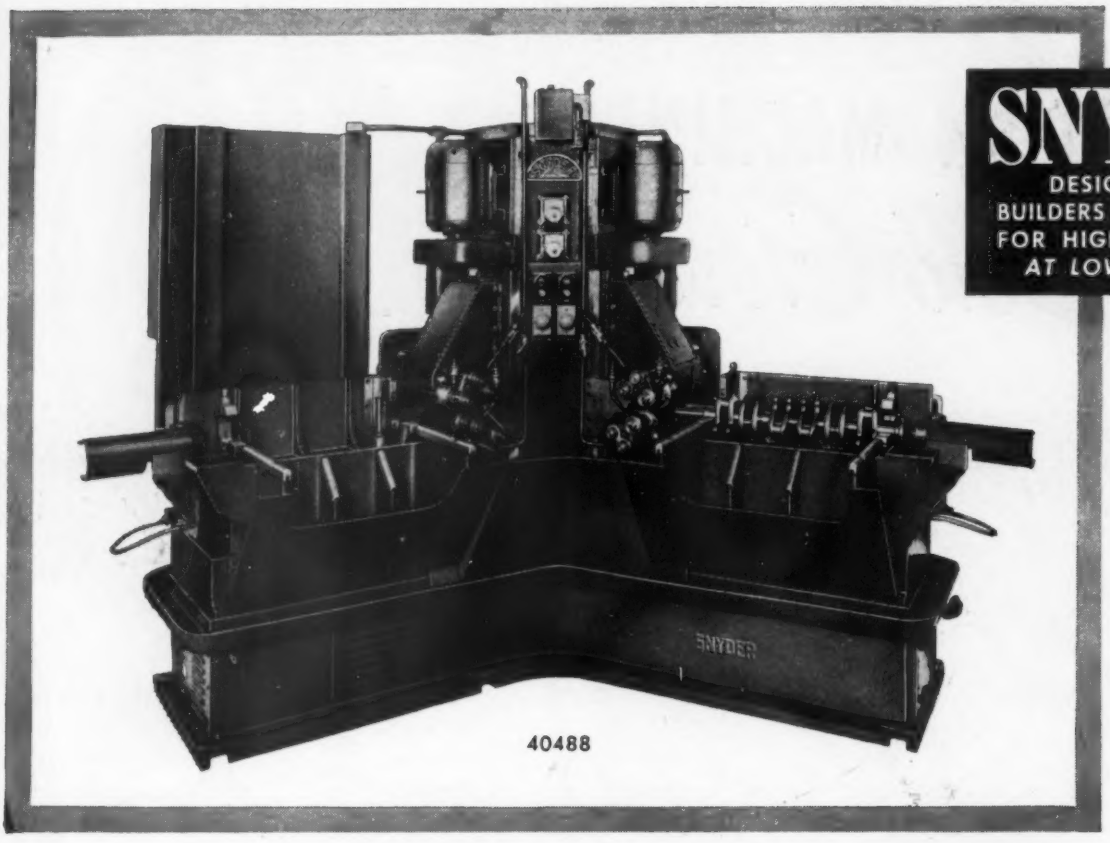
These truly modern production machines turn out precision metal parts FASTER. They help keep costs down—a highly important fact in these times of advancing material prices and higher wage rates.

The result, for the Sales Department, is either a lower selling price, to attract business, or a better margin where selling prices are standardized. *Your* Sales Department is interested in having you get complete Acme-Gridley information.

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing



SNYDER
DESIGNERS AND BUILDERS OF MACHINERY FOR HIGH PRODUCTION AT LOW UNIT COST

21 Years of Successful Cooperation with Leading American Industries

SNYDER SPECIAL AUTOMATIC CUTS 2 KEYWAYS IN CRANKSHAFT

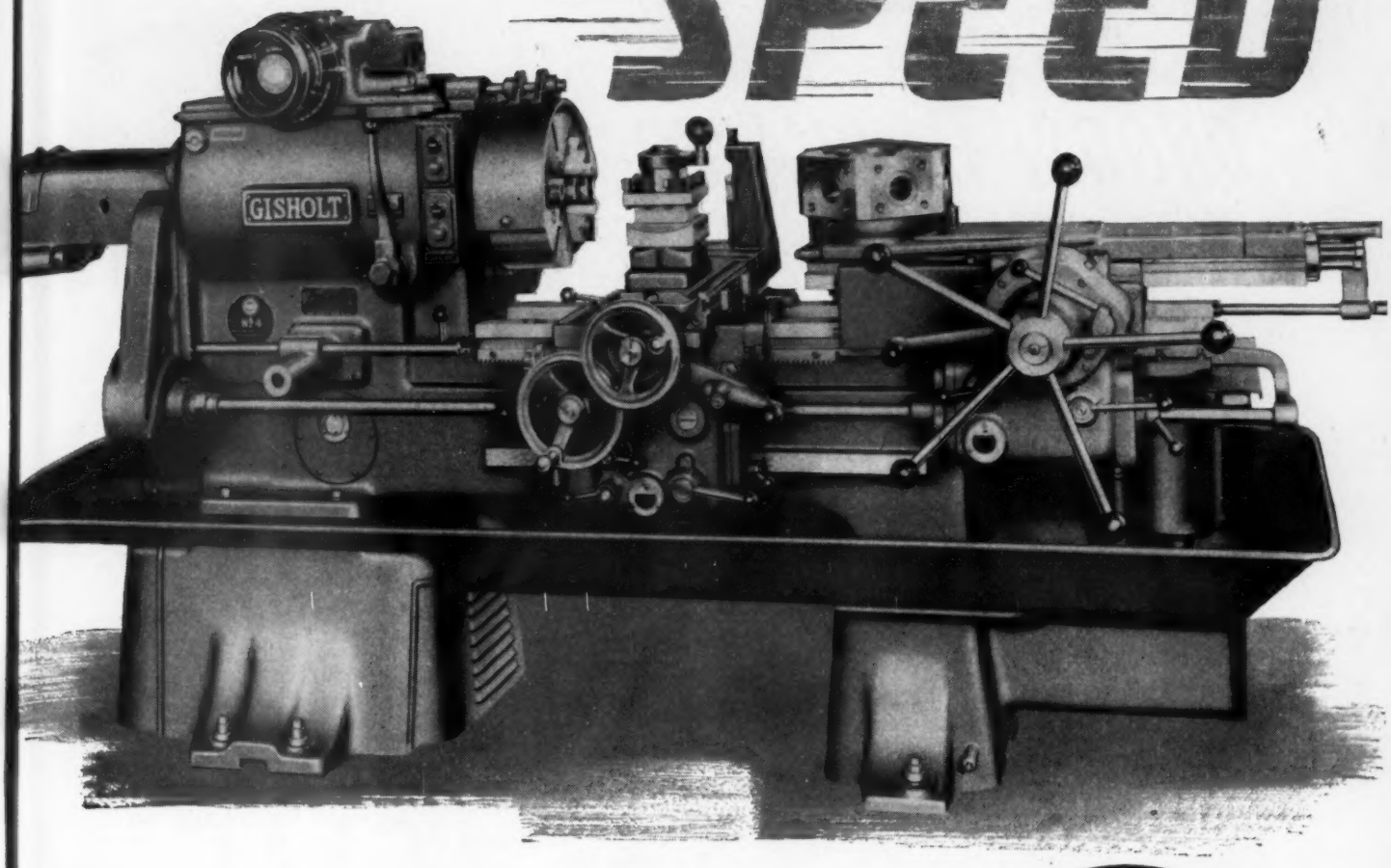
The automatic special illustrated was designed and built by Snyder Tool & Engineering Co., of Detroit, for rapid and economical cutting of keyways in a large auto crankshaft. Keyways are cut two at a time on one crankshaft while another crankshaft is being loaded and hydraulically clamped on the opposite work-holding fixture. Since single-purpose machine elements are employed, the machine is structurally and functionally simple and rugged, and operates at maximum production rates without sacrifice of accuracy or maintenance economy.

Push button control activates the automatic cycle. Spindle slides are provided with rapid advance and return and hydraulic feeds are readily adjustable. Fixture is automatically indexed away from the cutters to assure easy loading and unloading. Safety limit switches prevent starting machine before part is firmly clamped. With the exception of loading, operation is entirely automatic.

High speed steel cutters with integral shank are held in worm-gear driven spindles by draw bolt and receive additional support from live centers in the outboard spindle bracket. Cutting speed is approximately 40 feet per minute. Machine base and column are welded steel construction, thoroughly normalized and properly ribbed, and ample lubrication and coolant facilities are provided.

Efficiency of many operations in your manufacturing process may similarly be improved through the use of special machinery. As specialists in this field, we invite your inquiries. *Snyder Tool & Engineering Company, 3400 E. Lafayette, Detroit 7, Michigan.*

SPEED



with an easy change of pace to cut machining costs

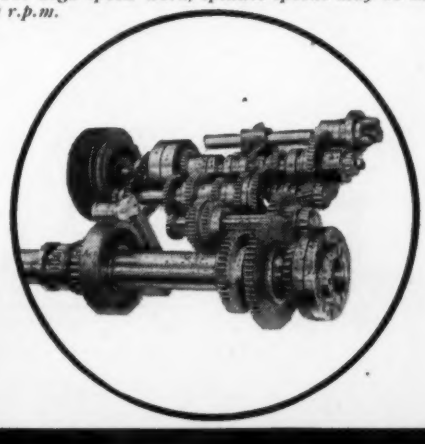
Turret Lathe operation reaches a new high in efficiency in these newest Gisholt Ram Type machines. Whether it's starting, stopping, or reversing the spindle—or shifting gears for any of 12 spindle speeds—it's quick and effortless. It means less time lag between cuts—faster production—lower costs.

And because so little physical strength is required, the fatigue factor is reduced to a minimum. Output is more nearly constant throughout the day.

Speed and lower costs will be more important than ever in the days ahead. Now is a good time to get all the facts.

THE GISHOLT SPEED SELECTOR enables you to indicate the sequence of spindle speeds to be used and then obtain the ideal speed for each cut when you want it, by merely touching a finger trip. Hydraulic power shifts the gears instantly.

12 spindle speeds ranging from 28 to 730 r.p.m. are instantly available in the Gisholt No. 4 Ram Type Turret Lathe shown above. For high speed work, spindle speeds may be increased to 1460 r.p.m.



GISHOLT MACHINE COMPANY

1201 East Washington Avenue • Madison 3, Wisconsin

Look Ahead . . . Keep Ahead . . . with Gisholt

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

CHOOSE the CHASER that fits YOUR JOB!

HOB TYPE for short runs, quick change, ease of dressing.

TANGENT TYPE for production runs with longer life.

BOTH ARE ACME

HILL ACME TOOLS FOR INDUSTRY

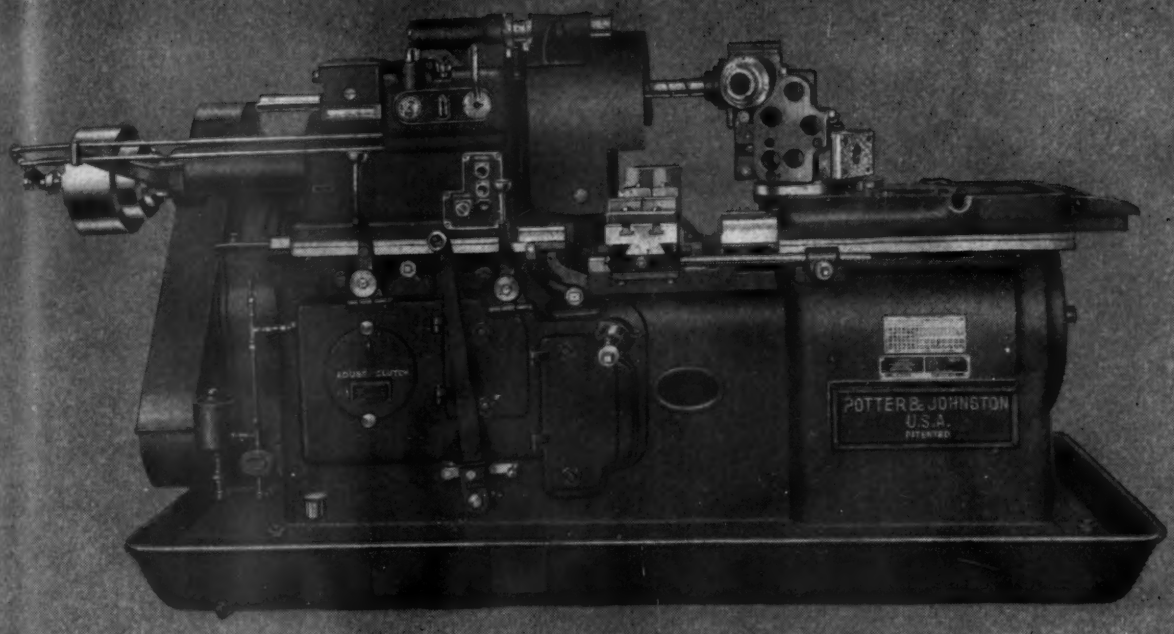
Either can be used on the ACME XL Threading Machine. Both are ACME Quality and Design!

THE HILL ACME COMPANY

ACME MACHINERY DIVISION • 4535 St. Clair Ave. Cleveland 14, Ohio
ESTABLISHED 1882

FORGING • THREADING • TAPPING MACHINES • ALSO MANUFACTURERS OF "HILL" HYDRAULIC SURFACE GRINDERS "CANTON" ALLIGATOR SHEARS AND PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES AND SHEAR BLADES

he P&J 4 D MANUFACTURING AUTOMATIC CHUCKING AND TURNING MACHINE



..... DUPLICATION OF SMALL PARTS CAN BE HANDLED AT LOWER COST...ON THIS MODERN MACHINE

Quality of finished product, increased output and an appreciable reduction in overall production costs as compared with hand machines makes the Model 4D P&J machine an invaluable means for machining a wide variety of small duplicate parts. It provides versatility in tooling and with its 15 changes of speed, arranged in five sets of three automatic changes with feeds varying directly with the spindle speed, its operation can be readily and effectively adapted to the specific job it is set up to handle.

Other features of this rugged, compact machine include: a Timken mounted spindle high carbon forged steel; headstock gearing of chrome nickel steel, heat treated and running in a bath of oil; all shafts of alloy steel, heat treated and mounted on ball bearings; speeds from 24 to 335 RPM; 27 feeds in geometric progression; cross slide mechanism fully enclosed and operating in an oil bath; rigidly constructed turret slide provided with hardened and ground inserts to form bearing on base ways.

●

Specifications

Swing over bed . . . 21" dia.
Swing over cross slide . . . 9¾" dia.
Cross slide travel . . . 3¼" each way
Number of turret faces . . . 5 std., 4 and 6 special
Hole in turret . . . 2" dia.
Turret feed . . . 5½".

●

Complete details on this machine are contained in Bulletin 112, available promptly on request.

POTTER & JOHNSTON MACHINE CO., PAWTUCKET, R. I.

HERE'S A NEW, ADJUSTABLE

CHUCKING REAMER

that assures

FAST, ACCURATE PRODUCTION

After months of careful research and actual production tests, Lempco is now ready to offer you the best chucking reamer ever made. It is made in two styles. Model C has a straight shank. Model CT has a tapered shank.

The new Lempco Reamer can be used in place of any standard reamer without changing set up. They will produce a smooth finish even when used to finish holes with keyways, slots, oil grooves or other interruptions.

Lempco Chucking Reamers are available in sizes from ¾" to 1 31/32". They have an expansion range of .025" to .031" according to size. These reamers *are not deformed when expanded.* They have straight line expansion, thus assuring a constant cutting surface over the entire length of the blade at all times. Blades can be resharpened 8 to 10 times, then economically replaced.

Decide right now to buy Lempco Adjustable Chucking Reamers. They will enable you to get better and more accurate production.

LEMPCO

5711 DUNHAM ROAD
BEDFORD,
OHIO

WRITE TODAY FOR FULL DETAILS AND PRICES OF THE NEW LEMPCO CHUCKING REAMER

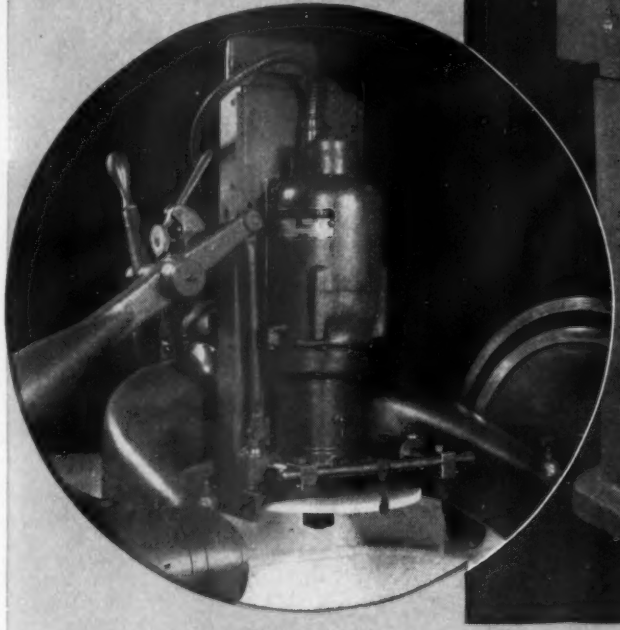
THE INGERSOLL *Cutter Grinder*

- **WITH NEW IMPROVED ROLLER BEARING HEAD SLIDE WAYS**

  Eliminating frequent adjustment — Reducing maintenance costs.

- **NEW REPLACEMENT HEAD AVAILABLE FOR OLD GRINDERS**

  Mounts in standard yoke. Write for quotation on new head.

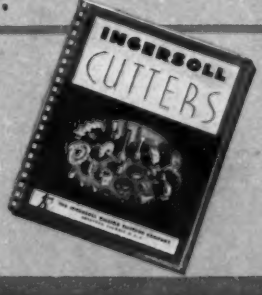


- The Ingersoll Grinder sharpens in a single setting of the cutter the face, periphery and corners of cutters from 4" to 30" in diameter. It will also grind solid shank, radius, staggered tooth, and angular inserted blade cutters.

For more details, write for Bulletin 54A describing its wide range of application.

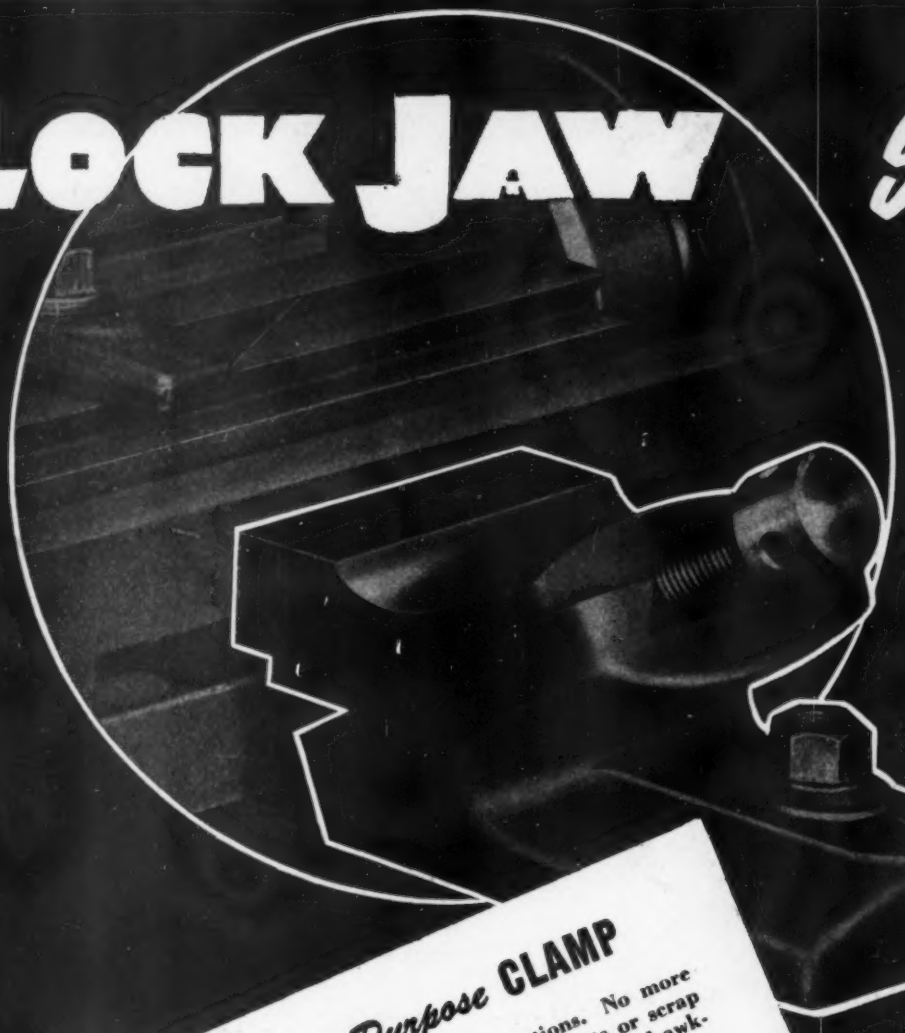
- Ingersoll also builds a complete line of inserted blade milling and boring tools with carbide tipped, cast alloy, or high speed steel blades — face mills, end mills, slotting cutters, helical slabbing mills, cylinder boring and combination boring, facing and chamfering tools.

Write for Bulletin 55A giving complete details on Ingersoll inserted blade milling and boring tools.



THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILLINOIS

LOCK JAW Stops



SLIDING

HEAVING

SHIMMYING

CHATTERING

YAWING

BUCKLING

HANDY *New All-Purpose* CLAMP

Eliminates expensive clamping and bolting operations. No more hunting around the shop for straps, bolts, washers, nuts or scrap pieces to wedge or lock your work in position. No oddly and awkwardly contrived, odd-sized and makeshift locks, limited in their ability to wedge and hold.

Now LOCKJAW gives you positive, powerful two-way locking, sure grip pressure downwards and side-ways. It may be set at any angle on the table and held by the T-slot bolt. Then LOCK-JAW pressure is applied to one or more pieces of stock by simply adjusting Capstan Jack Screw.

Setting up or taking down is a quick and simple operation. Every machine shop, tool room, or metal working unit can find many handy uses for this new Rivett conceived clamp on their planers, radial drills, shapers, milling machines, surface grinders and boring mills.

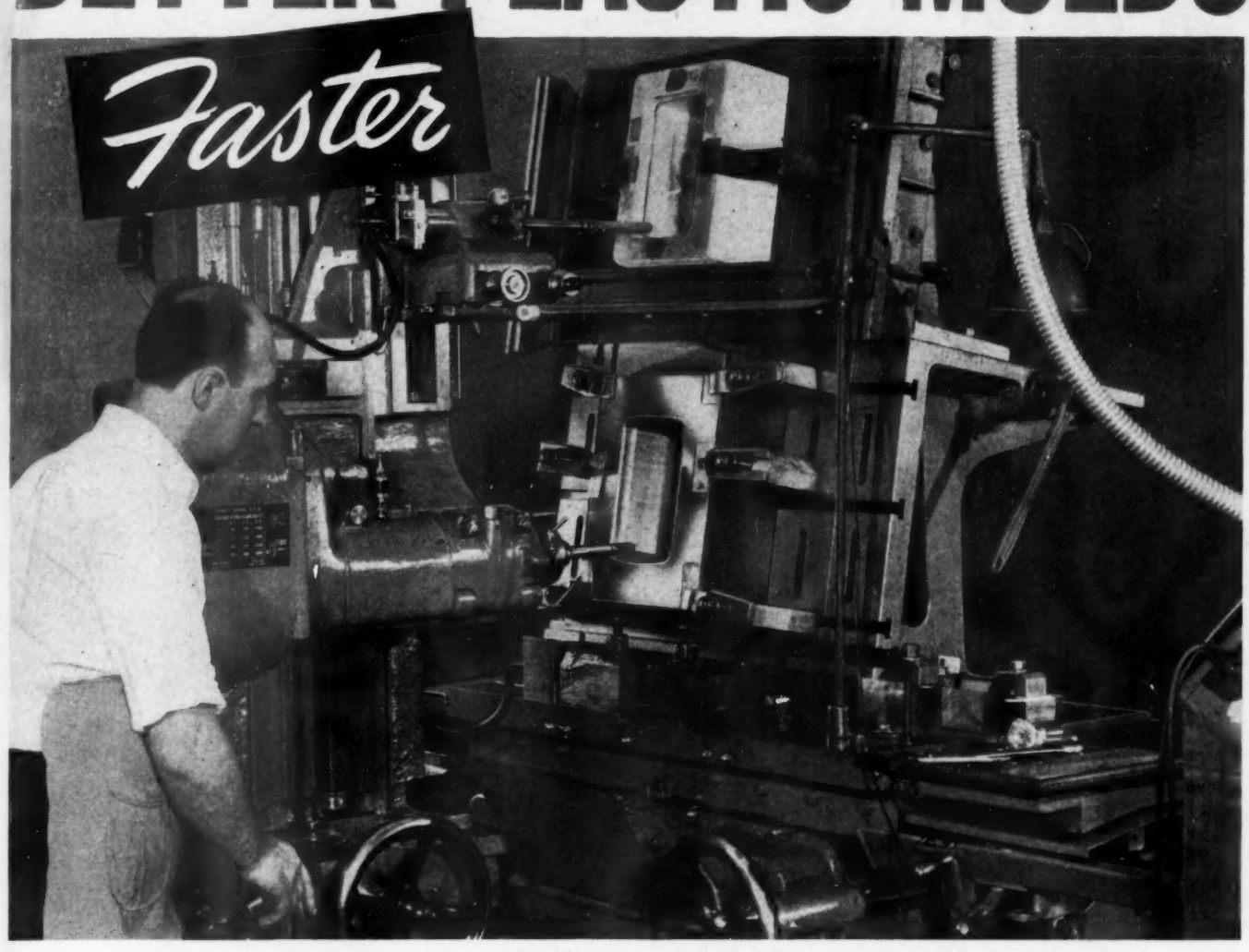
You, too, will save time, trouble and inconvenience when you use LOCKJAW to eliminate cumbersome and awkward clamping.

RIVETT

RIVETT LATHE & GRINDER, Inc.

BRIGHTON • BOSTON • MASS. • U. S. A.

BETTER PLASTIC MOLDS



The versatile Keller at work on a plastic radio cabinet mold at Sterling Engineering Company, Winsted, Conn.

A plastic product cannot be better than its mold. Production and profit demand not only more accurate molds but speed and economy in their making. All three — economy, speed and accuracy — are supplied by "tracer-controlled milling" of the Pratt & Whitney Keller machine . . .

Many plastic molds require fine detail on side walls or in deep corners, along with minimum draft angles (sometimes only a half degree). By ordinary methods, such detail is difficult and expensive to produce. With the versatile, flexible Keller, there is no such difficulty. As the illustration shows, the fixture which carries the master and the work may be tilted or turned at an angle as needed. This does not change the relationship between master and work, or between tracer and cutter, but it does make the side walls and corners easy to reach. Result — mold designers are free from mechanical limitations in producing complicated cavities.

A Keller in your shop will turn out both volume and variety of molds. It guides itself automatically, speeds production — lowers cost. There are Keller machines in sizes and with capacities to meet any requirement. Write today for full information.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1 • CONNECTICUT

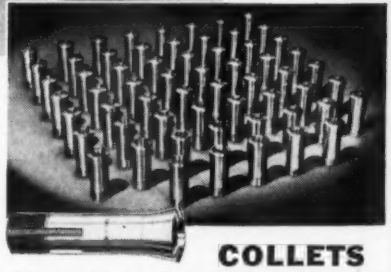
TO INSURE ACCURACY, USE —

SOUTH BEND *Precision* LATHES

South Bend Lathes help to increase plant efficiency and profits by raising precision standards both in the toolroom and in the production shop.

These lathes are designed and built to work to close tolerances and produce a smooth finish, for ease and speed of operation, and to give long, dependable service. Versatile, too, they are capable of performing a wide variety of operations on all types of machinable materials with a minimum of change-over and set-up time. Attachments are available which help to simplify and speed tooling for special classes of work, and in many instances eliminate the need for special fixtures.

South Bend Engine Lathes and Toolroom Lathes are made with 9", 10", 13", 14½", and 16" swings, bed lengths to 12', and collet capacities to 1". Precision Turret Lathes are made with collet capacities to ½" and 1". Write today for Catalog 100-D which illustrates and describes the complete line of lathes and accessories.



COLLETS

Equip Your Lathes with Complete Sets

A complete set of collets is especially helpful for toolroom and maintenance work. Often the time saved in getting out a single rush job without having to wait for a specially ordered collet will more than compensate for the cost of a full set of collets.

South Bend Collets are made in four types, and are available in either steel or brass. Each collet is carefully inspected and tested before it is packed for shipment.

SOUTH BEND LATHE WORKS

419 EAST MADISON STREET • • • SOUTH BEND 22, INDIANA

LATHE BUILDERS SINCE 1906

TWO SEPARATE OPERATIONS in the time required for rough milling—alone!

NEWTON MILL-N-SHAVER

Combination Unit Head Milling and Shaving Machine equipped with two single vertical milling heads and two finish shaving heads. Hydraulic feed to table.

The Newton Mill-N-Shaver performs two complete operations at one pass of the table. It rough mills at milling speed and finish shaves on the return, at the rapid traverse speed. This machine produces a perfect gasket surface. Two separate operations in exactly the time ordinarily required for rough milling alone. The Newton Mill-N-Shaver is designed to both step-up your production and reduce your costs on the types of work for which this machine is adapted. For detailed information, write for Bulletin No. 580.

Among Heavy Machine Tools built by Consolidated are . . . .

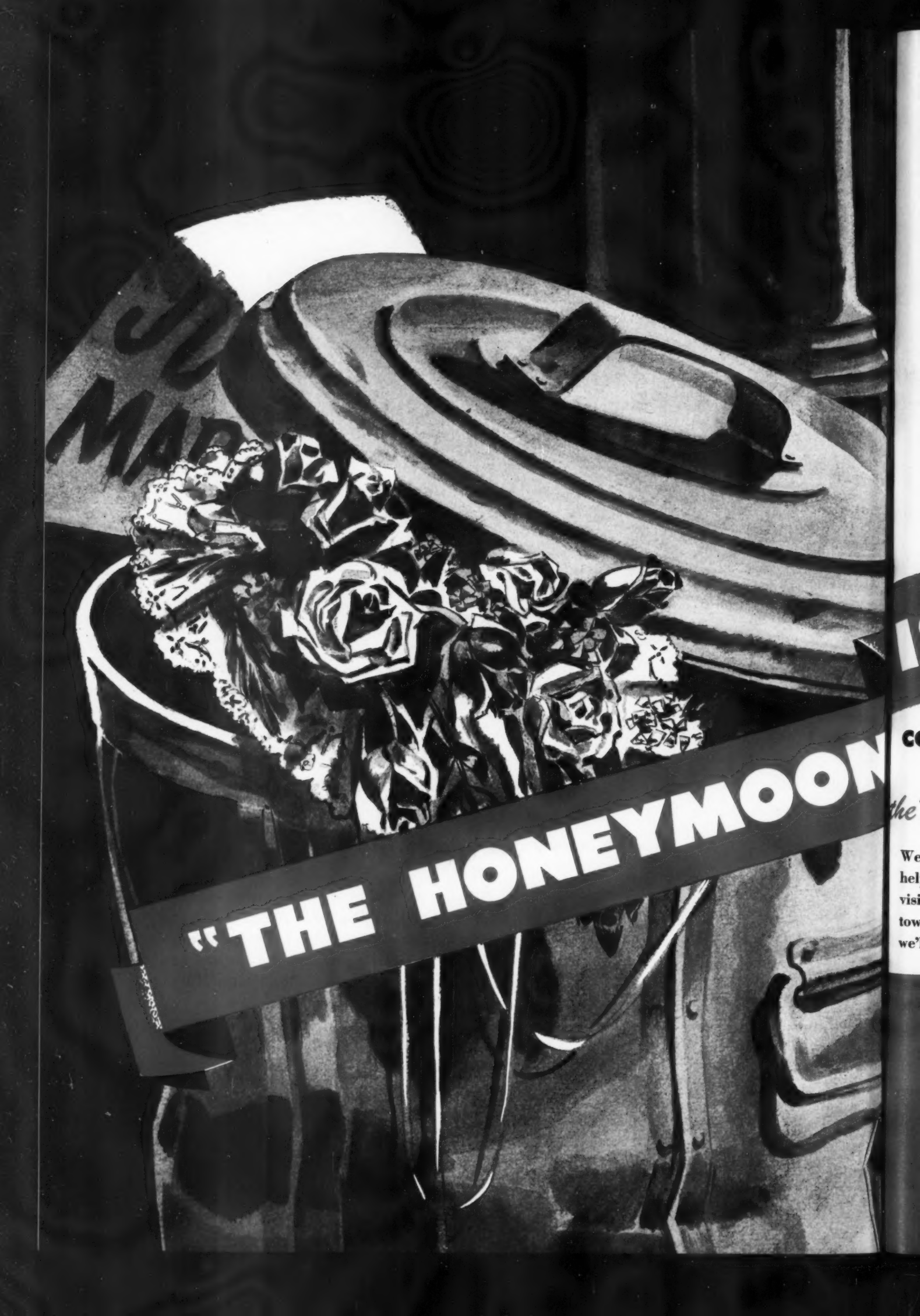
LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER
SPECIAL MACHINES

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1861

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10 NEW YORK


"THE HONEYMOON

THE realization of this fact has apparently been quite a shock to a lot of salesmen and manufacturers who have been riding through the "tunnel of love" these past few years . . . totally oblivious to the idea that *it couldn't last forever.*

This "writing on the wall" has been clearly visible for many months now, but apparently, many people can't read, or if they can, refuse to believe what they see.

For our part, we welcome the change. We're glad we have to SELL our products . . . not just make them, crate them and set them on the loading docks. We welcome the return of the good old 100% American competitive method of getting business. If you don't believe it has returned, then watch out, because it will have, before you can throw your hat out of the window.

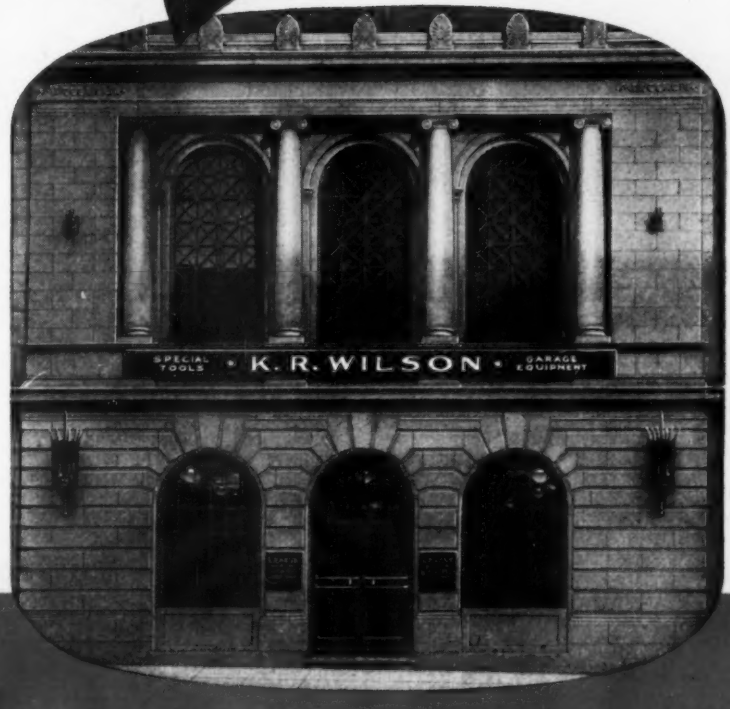
Just as soon as American ostriches . . . both labor and management . . . get their heads up out of the sand and go to WORK, just that soon will we all GO PLACES. Then, and only then, will America be able to produce the internal peace and prosperity she is capable of delivering.

IS OVER"

COME IN WHEN YOU'RE IN BUFFALO

the "City of Good Neighbors"

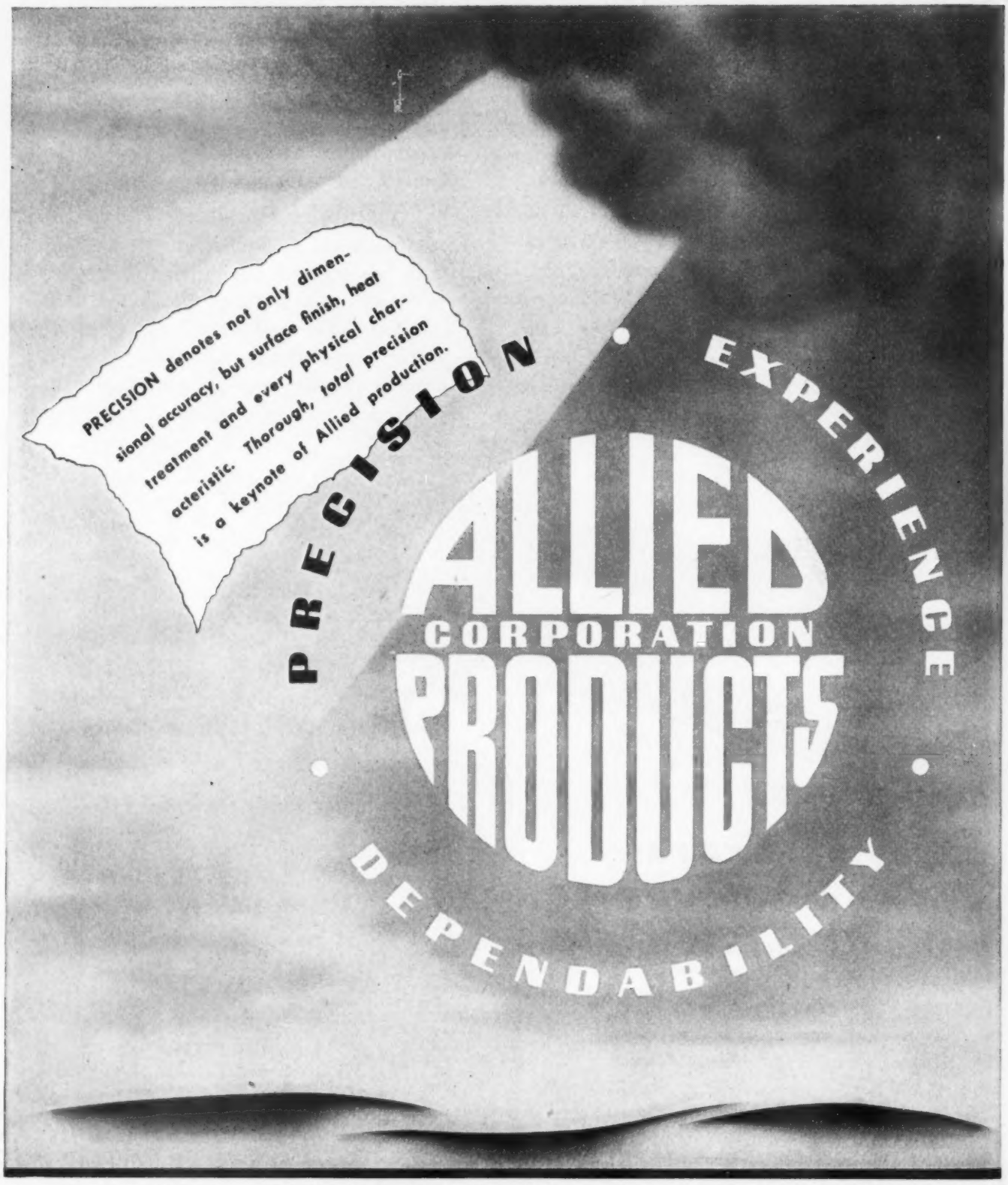
We would like to show you around . . . help in any way we can to make your visit pleasant. Our offices are right downtown. If it's hotel reservations, wire us, we'll get you in somewhere.



K. R. WILSON

215 MAIN STREET, BUFFALO 3, N. Y.

Manufacturers of Hydraulic Blanking, Stamping and Forming Presses . . Hydraulic, Electric and Air-operated Arbor Presses . . Hydraulic Brakes . . Die Try-out Presses . . Stretching Presses . . Complete Automotive Service Equipment . . Industrial Power Units.


PRECISION denotes not only dimensional accuracy, but surface finish, heat treatment and every physical characteristic. Thorough, total precision is a keynote of Allied production.
PRECISION
EXPERIENCE
ALLIED
CORPORATION
PRODUCTS
DEPENDABILITY

ALLIED PRODUCTS CORPORATION

DEPARTMENT 31

4612 LAWTON AVENUE • DETROIT 8, MICHIGAN

SPECIAL COLD FORGED PARTS • STANDARD CAP SCREWS • HARDENED AND PRECISION GROUND PARTS
SHEET METAL DIES FROM THE LARGEST TO THE SMALLEST • JIGS • FIXTURES • STEAM-HEATED PLASTIC MOLDS
SPECIAL PRODUCTION TOOLS • R-B INTERCHANGEABLE PUNCHES AND DIES • DIE MAKERS' SUPPLIES

WILLIAMS "C" CLAMPS

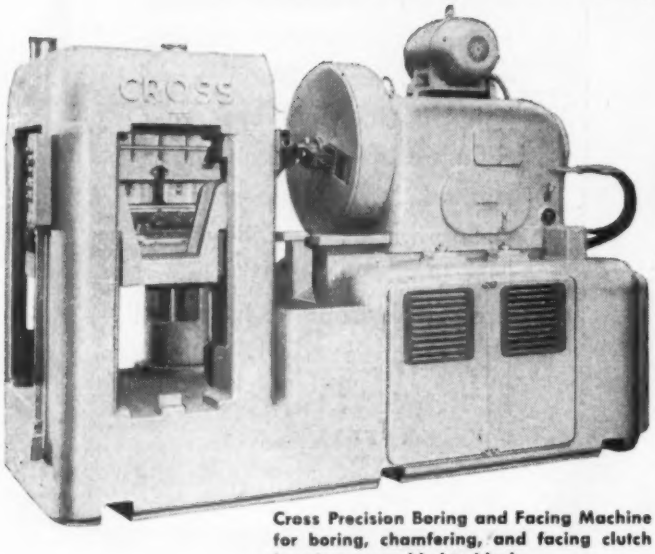
There's a Williams "C" Clamp for every industrial requirement . . . heavy, medium and light duty, or welding service. All are drop-forged and heat-treated . . . your guarantee of strength, dependability and long life. Williams "C" Clamps are sold by leading Industrial Distributors everywhere.

J. H. WILLIAMS & CO.
BUFFALO 7, N. Y.

WILLIAMS

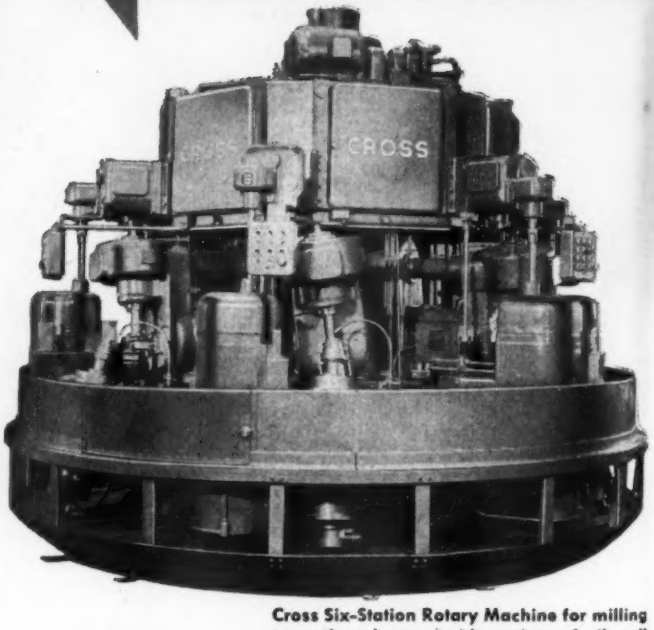
DROP-FORGINGS AND DROP-FORGED TOOLS

Control Costs
with CROSS SPECIAL MACHINE TOOLS



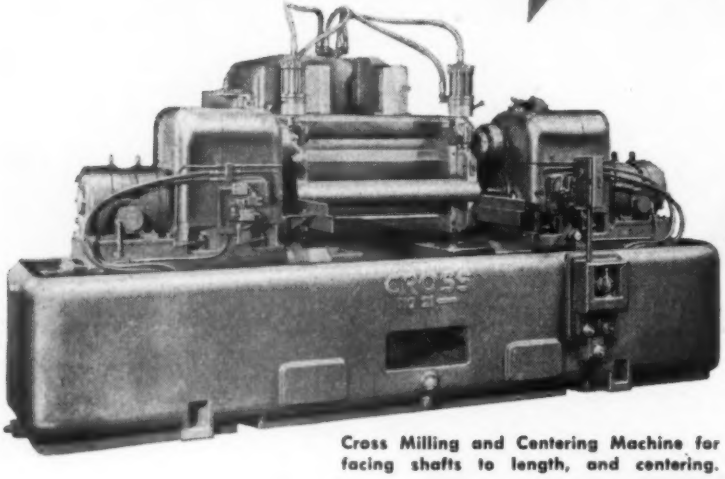
Cross Precision Boring and Facing Machine for boring, chamfering, and facing clutch housing, assembled to block.

Economy and Accuracy of Combined Operations



Cross Six-Station Rotary Machine for milling taper threads on a wide variety of oil well drilling cutters.

Continuous Production and Flexibility



Cross Milling and Centering Machine for facing shafts to length, and centering.

Wide-Range Adaptability

Cross cost-reducing machines have overcome many difficult production obstacles for manufacturers in a wide range of industries.

THE CROSS COMPANY

Established 1898

SPECIAL MACHINE TOOLS

DETROIT 7, MICHIGAN

MILLING • DRILLING • TAPPING • BORING • TURNING • SHAPING • GRINDING • HONING

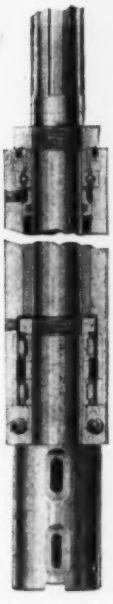
TOUGH STUFF

Photo: Courtesy Bethlehem Shipbuilding Co., Quincy, Mass.

Five-inch holes—in armor plate six and one-half inches thick, were completed in one drilling and two fly-cutting operations. From fifty to several hundred holes were produced per piece. The unusual performance of this Cincinnati Bickford Super Service Radial demonstrated its outstanding accuracy, ease of handling, and stamina.

Consult us on your drilling problems.

Write for detailed Bulletin R-24-A.
See our condensed catalog in Sweet's File.



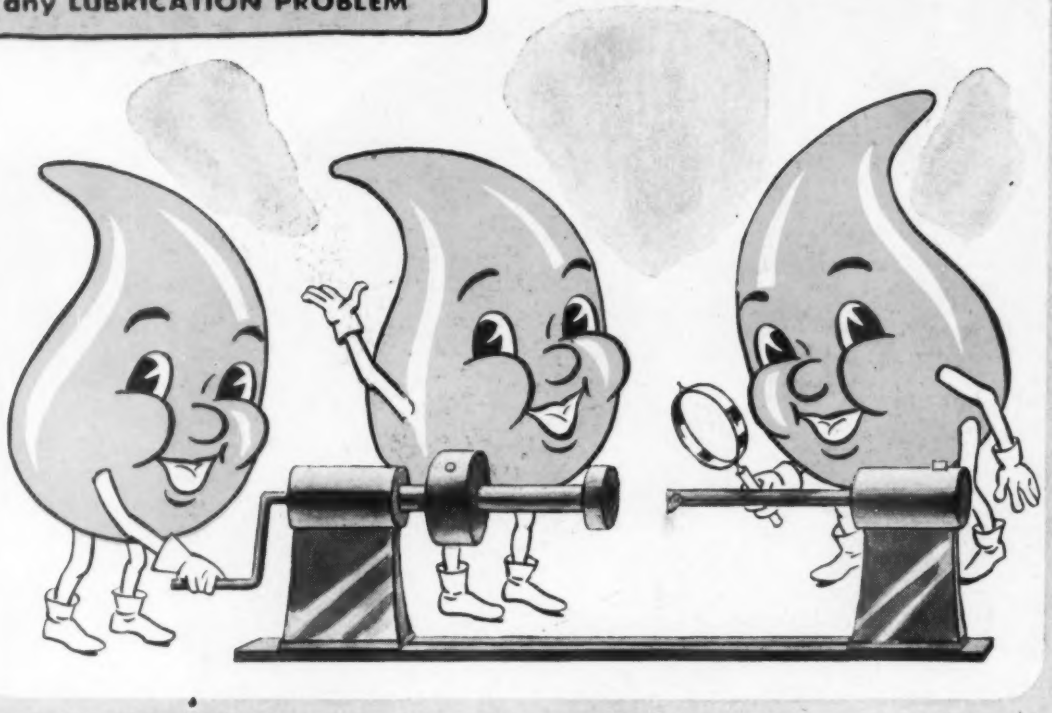
The Cincinnati Bickford chrome nickel spindle sleeve and bearings feed down with the spindle—so no matter what the length of feed, the spindle is rigidly supported. Feed pressure is taken by an unusually large thrust bearing. Roller and ball bearings require lubrication at intervals of three to four months.

Equal Efficiency of Every Unit Makes the Balanced Machine

RADIAL AND UPRIGHT SUPER CB SERVICE DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO. **Cincinnati 9, Ohio U.S.A.**

Call the
SHELL LUBRICATION ENGINEER as the FIRST STEP to the RIGHT SOLUTION of any LUBRICATION PROBLEM



A SHELL CUTTING OIL SAVES A GRINDING OPERATION

PROBLEM: Boring of cast-aluminum manifold valves was a three-step job for a metal specialties company: two steps with cutting tools, followed by a finish grind to smooth the results of "tearing." Attempts to obtain a satisfactory surface with cutting tools alone were not successful.

SOLUTION: When the Shell Lubrication Engineer surveyed the problem, he recommended a change to a Shell cutting oil of low-viscosity and extreme lubricity. The cutting operations were immediately improved—so much so, in fact, that the desired surface smoothness was obtained by the second or finish cut, thereby eliminating grinding altogether.

CONCLUSION: It pays to consult the Shell Lubrication Engineer, regardless of the nature or size of your lubricating problem. Write for informative literature on Shell Metal-Working Oils. Shell Oil Company, Incorporated, 50 W. 50th St., New York 20, N. Y., or 100 Bush St., San Francisco 6, Calif.

SHELL METAL-WORKING OILS

For every metal . . . for every operation

SHELL

American Machinist's

Spot NEWS OF METALWORKING

Housing program for '47 is to consist of 100,000 steel houses, 100,000-200,000 aluminum houses, 150,000-200,000 plywood houses and 150,000 precast concrete units. Most metal house designs call for wall, roof and sometimes floor panels of two sheets of aluminum or enameled steel two to six inches apart. Trouble has been that "prefabs" thus far have been mostly plywood using same materials as conventional houses, and materials shortages have crippled line production.

Only atomic pile-furnace and boiler will need to be shielded in lead and concrete to protect operating workers from radiation at new atomic power plant projected at Oak Ridge. Steam from boiler is not expected to pick up radio-activity from heat transfer agent.

Ferguson's break with Ford is reported to have been precipitated by the previous severance of relations between Ferguson and Ford at Dagenham, England. Ferguson tractors now are being built over there by Standard Motor Car. Parts makers supplying Ferguson have been notified by Ford to continue making parts on 1947 schedules, because Ford will make Ferguson tractors until next June and operate a tractor business of its own under a new corporation (possibly the Dearborn Corp.) thereafter.

Army and Navy are going too far too fast with jet-powered planes, say competent authorities. Future planes will need ever-increasing long range, which jet doesn't have. Reciprocating engines are good for at least 10 years. AAF is studying turbo-jet ranging up to 8000-lb. thrust and gas-turbine-propeller plants from 3000 to 15,000 horsepower.

Cost of doing business, with all the government reports, abnormal stock chasing and similar extras not required in 1941, has raised burden on direct productive labor by $1.75 per hour, according to studies made by one of the country's largest companies.

Labor relations note: president of a big metalworking firm has sent a questionnaire to all workmen to get their opinions (unsigned) about working conditions and suggestions for improvement. He also asked for suggestions for improvement of company's product.

Sales of diesel engines are soaring as result of the coal strike. All of the nation's diesel engine builders have substantial backlogs, with output exceeding the level predicted a year ago.

British government is making available drawings and prototypes of German machine tools to the British machine tool industry. Microfilm photographs can be obtained. Drawings are loaned for one month. Firms interested in Pfauter gear hobbers are to communicate with the Ministry of Supply immediately.

Maritime Commission has $16,000,000 worth of surplus marine engines, boilers, instruments and deck machinery for sale on a "make-us-an-offer" basis.

Navy's "Operation Highjump" in the Antarctic under Admiral Byrd will have plenty of competition. British have had a party down under since '42. Navy doesn't know what they are doing and wants to find out. Russians will arrive in December. Next year Swedes, Norwegians and more British will go down. We won't argue over the ice, but would over valuable minerals.

If labor conditions should be reasonably good, outlook for '47 is bright, according to survey made among its members by a leading metalworking association. Inquiries are brisk, cancellations have not increased, backlogs are steady, materials and parts inventories are low, work-in-process is high, surpluses have had little damaging effect except in machine tool industry.

(For further news, turn to page 149)

5 Operations performed automatically

ON THIS

MORRIS

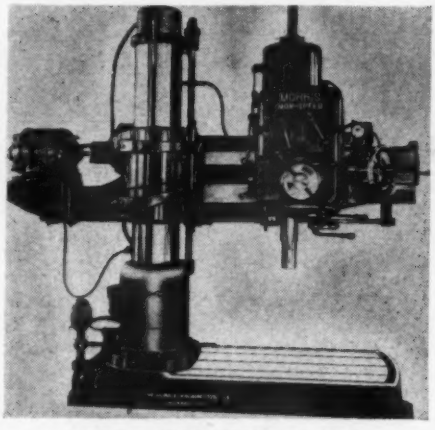
MOR-SPEED

HIGH PRODUCTION MACHINE

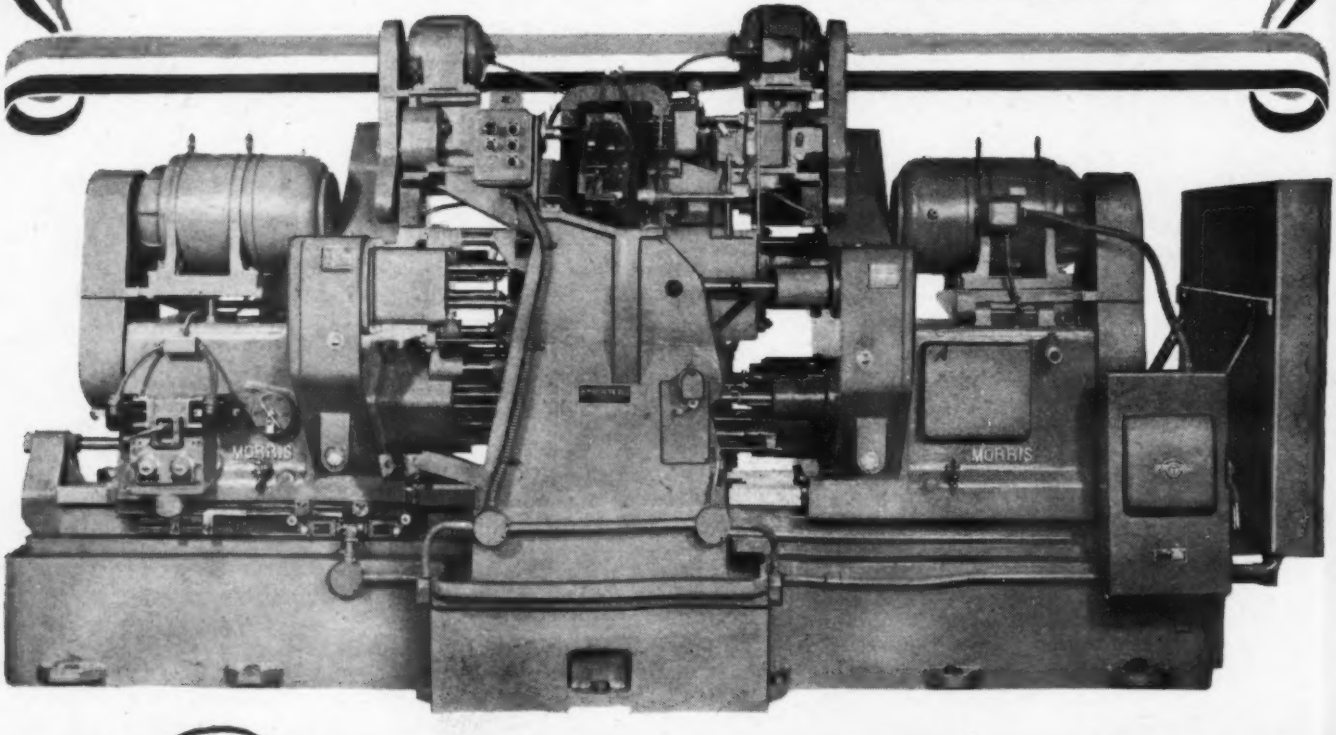
● This Morris Two-Way Horizontal Machine is equipped with two 15 H.P. hydraulic feed units and an 8-station automatic indexing turret with 20 spindle right-hand head, 21 spindle left-hand head, 6 spindle right-hand and 4 spindle left-hand tapping heads.

The machine is designed and built for drilling—reaming—boring—facing and tapping compressor frames. The work is hand clamped in the fixture, and a part is completed with every index of the turret.

This is only one of a host of high production machines designed—developed—and built by Morris. On your work requiring drilling—tapping—boring—facing and similar operations, in quantity, consult Morris—they have the engineering staff—the facilities—and the manufacturing "know how" to design equipment for specific jobs.



MORRIS MOR-SPEED RADIAL



Builders of MOR-SPEED Radials

The MORRIS Machine Tool Co.

CINCINNATI 3, OHIO

ESTABLISHED 1877

American Machinist

BURNHAM FINNEY, Editor

If They Mean What They Say

A machine tool demonstrator recently was pacing a new machine in a customer's plant to determine what output should be expected.

He was approached by a local union official who asked what he was doing. The demonstrator told him. It appeared that production should be geared to a rate of 60 an hour.

"If I were you, buddy," demurred the steward, "I wouldn't set it that high. All you can expect from that machine is 40 an hour." And all the operator produced was 40.

This incident is not unusual. Its counterpart occurs with disturbing frequency. Management too often has too little to say about how much output is to be secured from a new machine. The shop steward too often has too much to say.

These facts are brought to mind by the statement made by Richard T. Leonard, vice president of the United Automobile Workers, to members of the American Management Association:

"The union places no barriers in the pathway of basic technological improvements," he said. "It is concerned only to see that such innovations do not bring reductions in employment or slashes in hourly rates."

Let's admit that localized reductions in employment may result at times from technological advances. Over and beyond that, however, is the indisputable fact that mechanization of industry has been responsible for the high standard of living in America compared with anywhere else in the world. More goods for more people at low prices is compatible only with a constantly rising productivity per man hour.

Union leaders do not need to be taught these truisms. They have known them for many years. Mr. Leonard's statement shows an awareness of the situation.

Why then do national officers of the more powerful unions countenance their own local officers' setting a production pace geared far below top efficiency?

Is it an indication that national officers cannot or do not want to control the actions of their own members? Are these officers sanctimoniously and for public effect giving lip service to a policy which logically they cannot oppose, but which they have made no real attempt to sell to their own people?

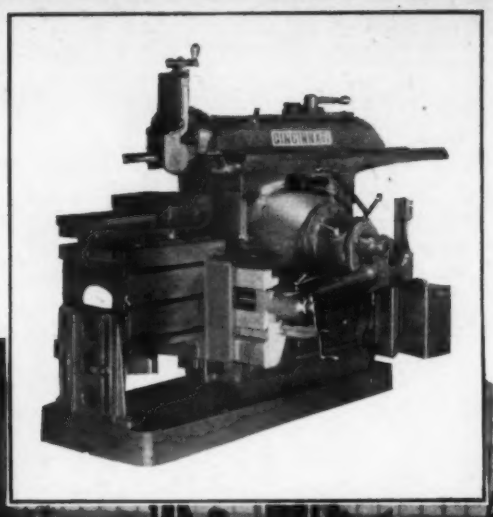
Clearly there is need for educating workers to the advantages of technological progress. A long and continuing program to that end should be undertaken. Individual companies, entire industries and American industry as a whole can help materially in this program.

More than anyone else, however, unions can do the job. What union leaders say will carry the most weight with their own members.

If Mr. Leonard means what he said, namely, that "the union places no barrier in the pathway of basic technological improvements," it is high time that he and other union leaders got busy and inculcated their own members with the fundamental facts which have made possible our high standard of living.

Burnham Finney

fine WORK...



Courtesy of
The Bunell Machine & Tool Co.
Cleveland, Ohio

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SHAPERS · SHEARS · BRAKES

Featherweight WHEELBARROW FORMED FROM MAGNESIUM

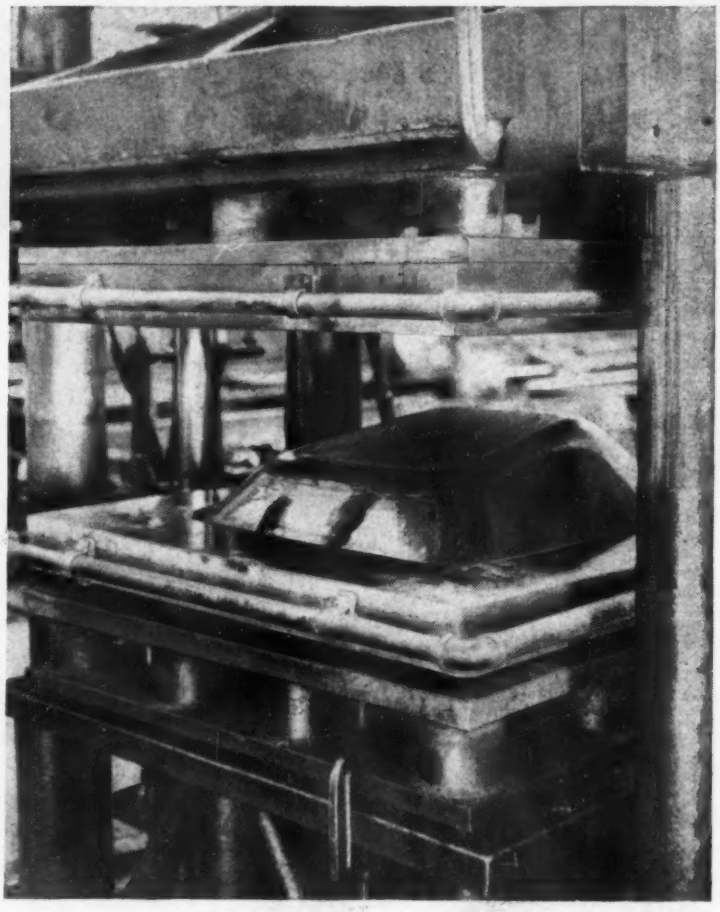
By CHESTER S. RICKER, Detroit Editor

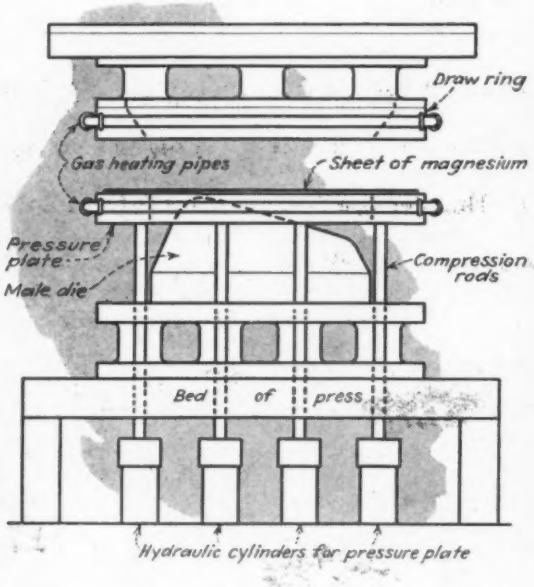
Only three machines are required to make the Dowcraft "Lawnbarrow," a 12-lb. wheelbarrow that is all magnesium alloy except the wheel assembly and five bolts. One hydraulic press forms the hopper, another rolls its edge, a brake forms the leg and brace. Handles are bent in hand fixtures on a bench. Brooks & Perkins, Detroit, who specialize in magnesium fabrication, produce the unit

ASSEMBLY

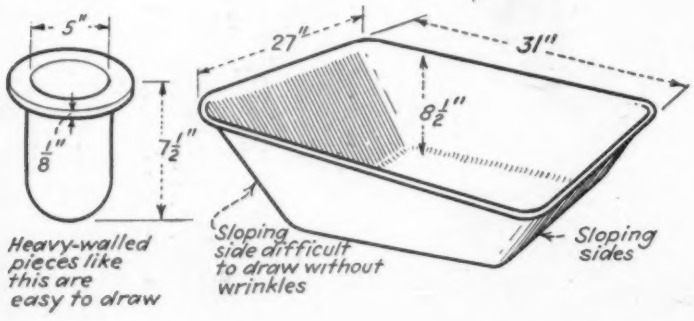
Clever design and ingenious methods combine to make the 12-lb. "Lawnbarrow" a production job. The assembly is made with a rivet and four carriage bolts. Legs are riveted where they cross. The body, or hopper, is inverted over a buck which holds the four body bolts from falling out. Tubular handles are dropped in place, covered by the legs, and the nuts set with an electric nut runner. Simultaneously, the fifth bolt, which is also the axle, is put through the lower handle ends and the ball-bearing wheel and pulled up with a ratchet wrench. The rubber tire is zero-pressure, 2¾ x 10-in. Now follow major production steps . . .

HOPPER FORMING—An 0.072-in. sheet of Dowmetal magnesium alloy about 38 in. square is formed hot in one stroke of a 75-ton hydraulic press (17-in. main piston). Work is about 625 F. when it leaves the furnace and kept hot at critical points during subsequent working by gas flames applied to the dies. This maintains good drawing temperatures without danger of hot-shortness from excessive preheating. Hydraulic action gives the metal time to flow, and special die design prevents wrinkling. Upward pressure of about 50 tons on the clamping ring (from five 3-in. and four 4-in. pistons) was needed to avoid wrinkling



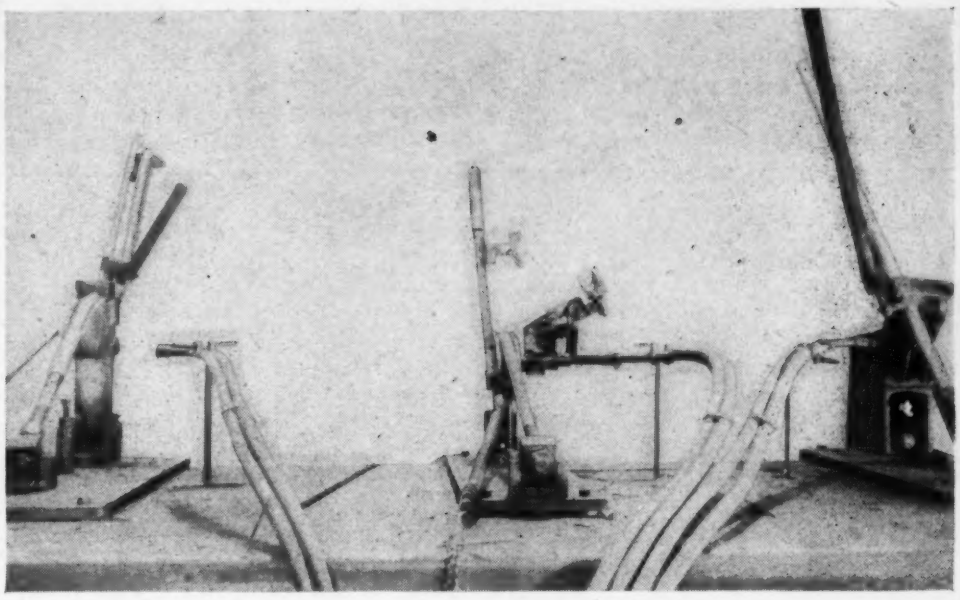


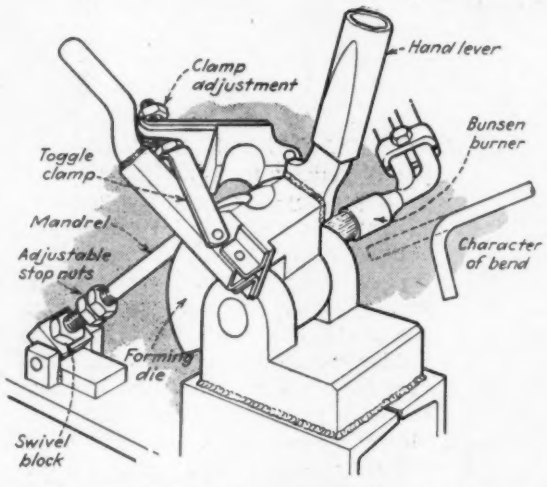
DRAWING DIE—The hot sheet of magnesium is placed on the clamping plate and clamped by a gas-heated ring. The draw ring, also heated by a ¾-in. surrounding pipe with closely spaced holes, is attached to the moving platen. The stationary die, however, is not heated (except from the work) to prevent reduction in wall thickness during drawing. Heated rings are carried on pillars to reduce heat loss to the press body. To prevent work from sticking, the draw ring is lubricated with a lactol-spirits suspension of colloidal graphite, removed later by a chromic-acid pickle. Surfaces are finished by hand-rubbing with fine steel wool. Chromate dip coating precedes spray-painting with one coat of Navy-spec. zinc-chromate primer and one of air-drying enamel



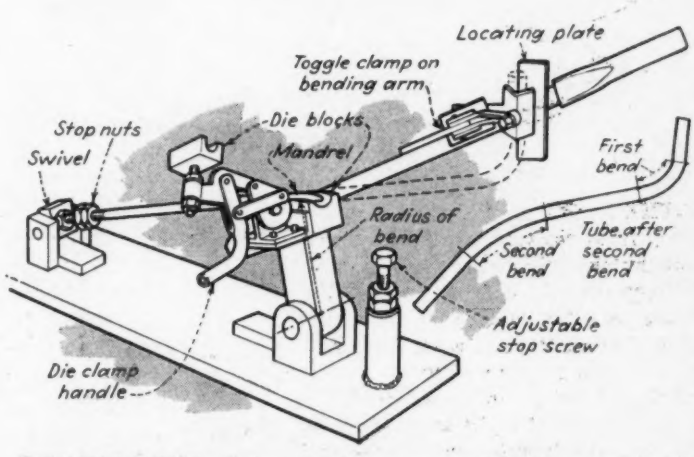
WRINKLE PREVENTION—Most difficult part of the job is to prevent wrinkles on the angular sides of the hopper, a problem which does not exist when sides of the part are drawn parallel to the press axis. Many oxygen cylinders (far left), 5 in. O.D. by 7.5 in. deep (0.125-in. wall) have been drawn without wrinkling, for example. But the 27 x 31-in. hopper, while only 0.072-in. soft stock and 8.5-in. max. depth, gives trouble unless proper temperature and high clamping pressure is provided.

HANDLE FORMING — Legs and braces are ¼ x 1 ¾-in. extruded Ma alloy. Legs are bent conventionally in a 10-ft. Chicago brake. Handles have three bends, hand-formed consecutively over mandrels while the tube is hot, gas flames being directed on the forming fixtures to maintain temperature. The straight tube receives its first bend in the fixture at right, then is indexed from this bend for the two subsequent ones at left. All fixtures have quick-acting toggle clamps, shown in the sketches

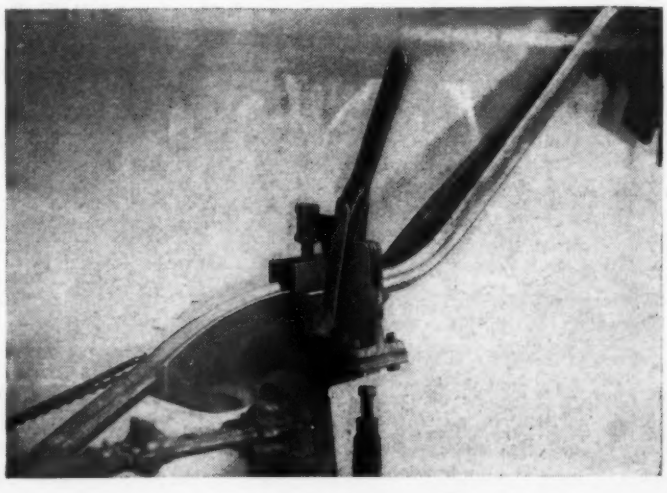




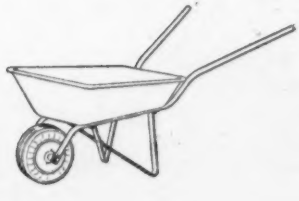
FIRST BEND—All three bends are made by hand, in fixtures gas-welded of steel castings and rolled sections. Standard or special toggle clamps hold the tube. In this fixture, a swivel block (lower left) allows mandrel movement, while adjustment to fix tube length is provided by stop nuts. The die is heated by a burner at the side. The toggle clamp is adjustable to suit tube diameter



SECOND BEND—A toggle clamp on the bending arm holds the first bend against a locating plate while the second bend is made. Here the die is sketched open, with the mandrel in position. Again the mandrel is on a swivel, with stop nuts to adjust its length. There is also an adjustable stop screw which catches the lower die block when the bend is complete. The gas heater for the block is not sketched, but may be seen in the group photo

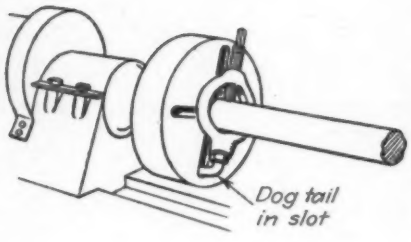


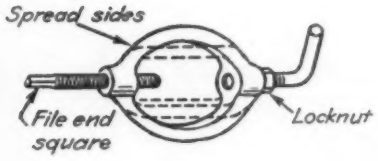
THIRD BEND—Again the tube is located by a clamp on the handle against a locating plate. Design is essentially similar to that of the second-bend fixture, with a quick-acting toggle clamp to hold the upper die, a mandrel, and a swinging arm which is stopped by an adjustable screw in a pillar. Here the bend is shown finished



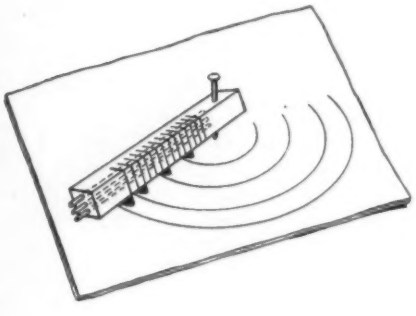
Short Cuts FOR THE SMALL SHOP

BY A. H. WAYCHOFF

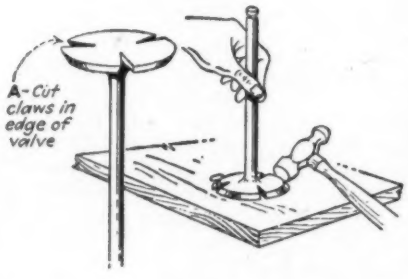




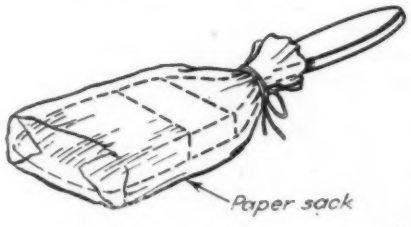
LATHE DOGS can be made in emergency from old turnbuckles removed from automobile brake rods or similar equipment. Simply spread the center of the buckle to suit the work. Cut off the rod with the right-hand thread to proper length and fit the thread with a locknut. Bend the tail of the rod at right angles. Screw this into the buckle, setting the tail at right angles, and tighten the locknut. Next, cut off the left-hand screw to make a setscrew for the work, and file flats for a wrench. This dog is used the same as any lathe dog.



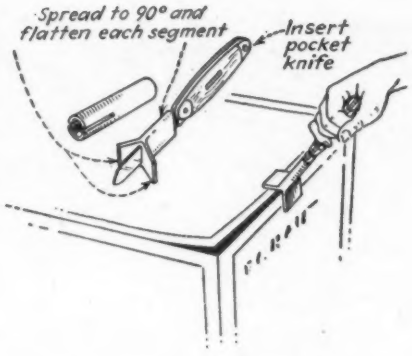
GASKET RINGS are easily cut from sheet without wasting stock, if a multiple cutter is employed. Secure a hardwood stick and cut slots ¼ in. apart in one edge with a coping or fret saw. Drill three lengthwise holes in the stick at the spacing normally found for holes in razor blades. Put blades into the proper slots to give the required half diameters (inside and outside) of wanted gaskets, as measured from the pivot nail in other end of stick. Push wires into the holes to keep the razor blades in place. With one full circular sweep, it is possible to cut several concentric gaskets in diameters needed.



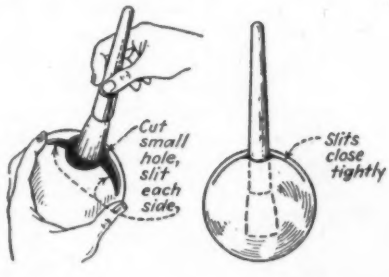
TACK AND BRAD PULLERS are handy to have in various kinds of work, and an old exhaust valve from an auto engine can be made into a good one. Merely file several small notches in the edge. If the seating surface is ground to a sharp edge, it will prove helpful in getting under the head of the tack. Then pull back on the valve stem and the tack comes out.



KEEPERS for paint brushes can be made from paper sacks, and will keep the brushes soft and without damage to the bristles for short periods. Thus, the need for frequent cleaning of brushes is avoided. If the bags are not made of moisture-proof paper, dip them in paraffin to avoid dripping and keep out air. Brushes protected in this manner will be soft for a month or so.



POCKET CARTON OPENERS are handy gadgets to workers who must open packages of parts required in assembly operations. To make one, take a short piece of thin-wall tubing, split as shown, bend the segments 90° apart and flatten. Slip the blade of a pocket knife into the holder, which now protects the operator from slippage and cuts the carton edge quickly. Another feature is ability to produce a clean-cut edge, which is desirable now that cartons must be salvaged and re-used wherever possible.



BRUSHES used in shellac, varnish and lacquer have a disconcerting habit of getting hard between short periods of use. To overcome this, procure a rubber ball with an inside diameter slightly greater than the length of the bristles. Cut a hole to fit the brush ferrule snugly, then make a slit on each side of the hole. By pressing the ball, the slits open and the brush bristles can be inserted. When the ball is released, the slits close tightly, and drying out of the bristles is prevented.

TALKING SHOP

Office Motto

BE THANKFUL for the troubles for your job. Without them it could be filled for about half your salary.

—Robert R. Updegraff

Inconstant Compass

ALL compasses need not point east and west. Make a needle for one of the new magnetic material Silmanal. This silver-manganese-aluminum alloy can be magnetized widthwise instead of lengthwise.

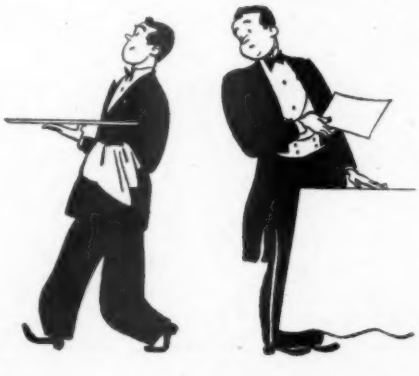
Buck Passing Thinks

"WE ALL LIKE to think we like to think, but most executives I know do just what I do: When I have tough thinking to be done, my tendency is to look for a vice-president to whom to assign the job."—Paul G. Hoffman, pres., The Studebaker Corporation.

If it works, the office boy, junior engineer or equivalent keeps very busy.

Tux Solo

RALPH E. FLANDERS, chairman of the board of Jones & Lamson Machine Co., delivered the address of award when the Henry Laurence Gantt gold medal was presented to Paul Hoffman of the Studebaker Corporation. The "senator tantamount," as Paul Hoffman alluded to him (Mr. Flanders had recently received the Republican nomination in Vermont) found he alone was in tuxedo; about a thousand dinner guests were in business clothes. Said Mr. Flanders: "Apparently our friends who have been waiting on us and I are the only ones present who appreciate the importance of the occasion."



A Play on Words

ONE of our friends in the steel industry was giving us an article lead. "Say," he says, "you should get on down to Boston and see Gillette Safety Razor. They are doing some mighty fine machining on stainless steel—particularly after they solved some form-tool problems."

"Just how did they solve this form-tool trouble?" says we.

"Why," says he, "they simply run a shave tool into the set up. Ho, ho, ho!"

Get it? Seriously speaking, though, form-tool troubles were pretty well cleared up by intelligent use of the shave tool.

Home Talent

PRIOR to World War II, virtually all steel rods for reduction into wire for automotive valve springs were imported from Sweden. Extremely high-grade ores were readily available there, and most Swedish iron plants were small units utilizing charcoal rather than coke for fuel, resulting in a cleaner iron and a cleaner steel. Rolling mills were small, hand-operated units which permitted extreme care in producing rods with virtually no seams or scratches. Extremely high surface qualities are important in avoiding failure of springs compressed and released 4,000 times each minute.

With the advent of the war, shipments from Sweden were cut off, and metallurgists of the American steel industry, including American Steel & Wire, were faced with replacing that source. The result was a product superior even to the Swedish material. Only carefully graded pig iron and steel scrap are used, and improved steel-making practices have been developed. Special heat-treating methods, together with close rolling and drawing controls, also contribute.

Formula for Tact

TO GET ALONG in business: Be brief—politely. Be aggressive—smilingly. Be emphatic—pleasantly. Be positive—diplomatically. Be right—graciously.

To EASE pressure upon our Fictionary Editor, Harold L. Flynn comes up with this issue's installment of our rocky road to better understanding of something or other:

CHASERS—Machine-shop wolves.
EXTRUSION—Act of giving the bum's rush.
CROSSHEAD—Liverish boss.
BOLSTER PLATE—The main dinner course.
STEP TURNING—Spiral staircase.
TAPER ATTACHMENT—Pin-headed boy friend.
BYPASS—"Not tonight, Josephine."
PERMANENT MAGNET—Rita Hayworth.
DEBURRING—A six-day shave.
LINE PRESSURE—A party line.
DIEHEAD—Funeral-parlor director.
BOOSTER PUMPS—High-heeled shoes.
FEED SCREW—Mixmaster.

Spring Saver

10,000 COIL SPRINGS which exceeded compression specs by ½ to 1 lb. each were destined for the scrap heap at a Michigan spring plant. A few minutes exposure to blast cleaning relieved surface tension enough to salvage the whole lot, according to American Foundry Equipment Co.

Talk Did It

EXPLAINING that his personal preference in accepting the Henry Laurence Gantt gold medal was to follow Ralph Flanders' experienced advice and bow graciously and sit down, Paul G. Hoffman apologized for the remarks required of him with this story: In South Bend, Ind., where a wedding is still a wedding and a funeral still a funeral, a happy bride and groom rode down the street in a limousine. They smiled and waved to the grinning populace, oblivious of the 4-ft. sign on the rear of the car, "Careless Talk Did This."

How to Polish and Buff Plastics

Proper selection of compounds and wheels for the particular type of plastic and effective operating sequence will help reduce plastics polishing cost

HIGH FINISHING COST of many plastic products is emphasizing the importance of polishing and buffing procedures. Although the surface of the mold or cavity usually gives the desired finish to the product, flash, sprue projections, gates and burrs must be removed and the surface matched by polishing and buffing. Volume of finishing is further increased by articles which are cut and machined from cast or extruded sheets, rods and tubes.

Heavy flash and sprue projections may be removed by belt sanding. The silicon carbide abrasive belts have proved most effective for plastics. Recommended grits are 50, 80, 100 and 120 for roughing; 180 and 220 for semi-finishing and 320 and 400 for finishing. A speed of 4000 sfpm. is most effective, but a range of 2200-5000 covers all conditions of plastics products.

With a good exhaust system to remove dust and do some cooling by pulling air past the edge being sanded, thermosetting plastics can be successfully sanded with dry belts. This eliminates a washing and drying operation that normally follows wet-belt sanding.

However, wet-belt sanding has advantages such as lack of dust, longer belt life and less belt loading. In advanced practice, thermosetting plastics are usually sanded dry, while thermoplastics are sanded wet.

Wheel Sanding

Flexible polishing wheels with a dry resilient abrading face are recommended for removing light or residual flash, surface imperfections and marks from cutting tools. They are also used for smoothing irregularities in the contours left by belt-sanding thermosetting plastics.

In flexible polishing, the cutting face is formed and maintained by periodic frictional transfer of compound to the revolving polishing or buffing wheel. Amount of flexibility in the wheel is governed by contour of the plastics product and is obtained by selecting a wheel of proper resiliency. For regular contours, a compressed-canvas wheel is used; for more irregular contours the choice is between pocketed buffs or full-disk buffs. A full-disk muslin buff at 5000 sfpm. gives satisfactory results.

As thermoplastic articles are readily distorted by heat, a ventilated pocketed type buff used at 3000-4000 sfpm. with minimum work pressure is safe practice. As further insurance against overheating, the compound may be top-dressed with stick-type lubricant, which should not penetrate the cloth.

Before the development of flexible polishing methods for plastics, this type of finishing was done by wet ashing. With thermoplastic materials, there are still cases where a wet-ashing operation must be performed for removal of cold spots and tear drops from complex surfaces that cannot be touched by other methods. A loose muslin buff is used at about 4000 sfpm. with No. 00 to No. 1 wet pumice, and a packed buff may be used where greater flexibility is needed. Disadvantage of ashing is that parts must be washed and dried before subsequent buffing operations.

Cut-down buffing produces a semi-gloss finish from a dull, sanded surface. Where higher grades of finish are required a final luster buffing or waxing is applied. A buffing bar with no free grease is well suited for buffing plastics as it leaves a minimum of buffing dirt. A good grade of compound often eliminates an added cleaning operation.

In cut-down buffing of thermosetting plastics, compounds containing fast-cutting buffing powders are used on sewed, pocketed or full-disk loose-muslin buffs, depending on flaws in the product and its contours. Speeds of 4000-6000 sfpm. are recommended. There are few cut and color operations used in finishing thermosetting plastics. On red phenolic parts, a red compound on a pocketed or full-disk loose-muslin buff at about 5000 sfpm. is recommended.

For luster buffing of thermosetting plastics, the compound should have a lower grease content and an unfused aluminum-oxide powder such as levigated alumina. For white plastics, the compound should be pure white in shade, on a loose muslin buff, operating at 4000-5000 sfpm.

Matching Colored Plastics

Pigments are added to compounds to match the shade of plastics products. This eliminates the need for cleaning as any transferred composition will not be noticeable and exposed fillers such as wood flour will be colored the same shade as the rest of the surface.

Because of the messy nature of

wet ashing there is an additional need to replace this operation wherever possible. A modified compound is used for cellulose acetate and cellulose acetate butyrate in an operation called semi-ashing. Although as many as four buffing operations are recommended for some plastics it is only in rare cases that all are needed. The original condition of the surface and the finish required in the individual case will determine which operations can be eliminated for the sake of economy.

Finishing Plastic Laminates

On surfaces of laminates where the fibrous filling material is completely covered, polishing and buffing operations are the same as those for the particular plastic binder involved. At the cut edges, where the laminating filler is exposed in both the plastic binder and the fibrous filler, they must be abraded together.

Cut edges of laminates can be polished or sanded with a greaseless Grade C compound on a spirally sewed muslin buff (usually ⅜-in. sewing) at 6000 sfpm. No lubrication is required in the operation when thermosetting binders are used. However, if thermoplastic binders are encountered the surface of the compound should be top-dressed or lubricated to prevent overheating.

The sanded surface from this polishing operation can be brought to a high luster by using special grades of compound. A canvas-filled melamine laminate can be cut down after polishing with a Grade 155 compound and luster-buffed with Grade 304-B compound, both operations being performed on a loose muslin buff at about 5000 sfpm.

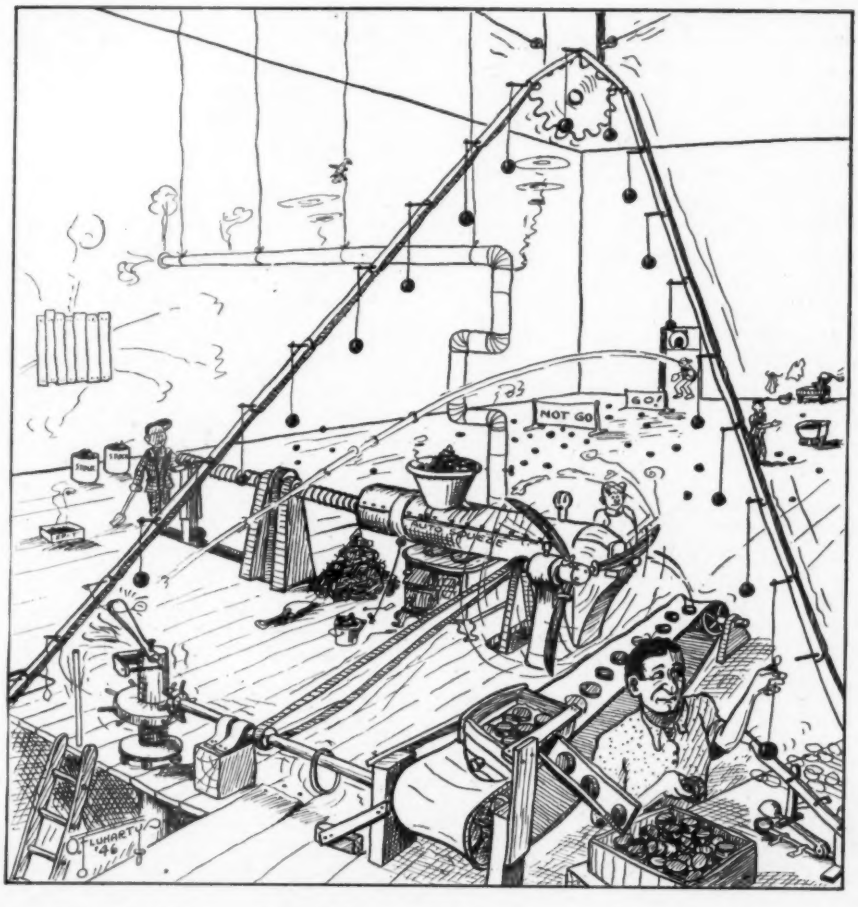
When the fibers of the filler are long, hard and not impregnated (such as a fiber-glass laminate) buffing to a high luster is impractical at the present time as the long, hard fibers protrude and make it difficult to produce a flat, lustrous surface.

BUFFING COMPOUNDS FOR THERMOPLASTICS

MATERIAL	GRADES OF COMPOUND			
	Semi-Ash	Cut Down	Intermediate Cut & Luster	Luster
Cellulose Acetate	869	855	843	832
Cellulose Acetate Butyrate	869	855	843	832
Cellulose Nitrate		765	S-28	773
Ethyl Cellulose		765		832
Acrylics		855	843	884
Polystyrene		155	S-28	773
Casein Plastics			S-30	

Buffing speeds should be kept between 3000 and 4000 sfpm. Pocketed or ventilated buffs are suggested for semi-ashing operation and generally for cut-down buffing. Soft pocketed muslin buffs are best for final luster buffing. (Courtesy Lea Manufacturing Co.)

OUR SHOP...15 — *Plastic Dept.*



TIPS for Top Shop Men

140 No subordinate's problem is childish or it wouldn't be important to him. "Pressure," or "rush nerves" are frequently offered as excuses in passing over someone else's problem of the moment—a problem that may be simple from your point of view but may be so difficult from his that it stands constantly in the way of his best work. If you give him a brush-off, you add resentment to confusion.

141 Keep up with the latest foremanship in articles, in books, in training courses. Particularly from the standpoint of proper psychological treatment of the handicapped and of veterans, especially rehabilitated ones, management has taken great strides recently.

142 Put yourself in the place of the worker. How do you want your boss to treat you? Are you as fair, objective, considerate and understanding with your employees as you want your immediate boss to be with you?

★ A SPECIAL American Machinist ROUNDUP REPORT

Where To Use

LOW-ALLOY, HIGH-STRENGTH STEELS

High strength, easy fabrication, excellent corrosion resistance make them especially desirable for mobile equipment and other structures where weight and life affect operating and service costs

BY HARRY S. WHAREN, ASSOCIATE EDITOR

HIGH STRENGTH, superior corrosion resistance, good working and welding characteristics, and excellent abrasion and impact resistance are offered by low-alloy, high-strength steels to meet the demand for weight saving and longer life.

Curtailed in production during the war by lack of alloying elements, they still filled needs in numerous military and naval applications, including tank and truck parts, amphibious vehicles, landing craft and gun mounts. But they are once again available for their many peacetime uses: railway cars, ships, trolleys, trucks, buses, materials-handling equipment, mine cars, bridges and other steel structures—wherever reduced weight and long service life lead to lower operating and maintenance costs and greater pay loads.

Superior Characteristics

Since the war, there has been a decided trend toward wider application of high-strength steels in high-tonnage markets, not only because of their superior characteristics but also because the price spread between these steels and structural carbon steels is continually narrowing.

The superior characteristics of high-strength steels are obtained by a proper balance of the alloying elements: carbon, phosphorus, manganese, silicon, copper, chromium, nickel, molybdenum and zirconium in varying proportions. The proper balance of elements provides, in the as-rolled condition, a proper balance of properties essential for structural uses. Even though equal, or superior, mechanical properties are obtainable in heat-treatable steels, many applications of high-strength steels are such that heat treatment is difficult, if not impossible, because of large, unwieldy plates and shapes and possible loss of properties during welding or flame cutting. It is necessary, therefore, that the desired properties be obtained as-rolled.

The tensile strength of high-strength steels is usually given as 70,000 psi. minimum for thickness up to ½ in., as compared to 50,000 to 65,000 psi. for railroad-car steel ASTM A-113 and 60,000-72,000 psi. for bridge and building structural steel ASTM A-7. But the yield-point strength, rather than tensile strength, indicates the useful strength of a structure, because beyond that point permanent deformation occurs. Moreover, working unit stresses are based on the yield point, being determined by dividing yield point by factor of safety.

The minimum yield point of high-strength steels (in sections ½ in. and under in thickness) is given as 50,000 psi., compared to 33,000 psi. for ordinary structural steel (ASTM A-7 and ASTM A-113). Thus, the yield ratio for structural steel is about 0.50 to 0.60, but increases to 0.70 to 0.75 for high-strength steels. As a narrow range between yield point and tensile strength generally results in lower ductility, the yield ratio is usually held under 0.75.

But with the higher yield point, the working unit stress, using the same factor of safety, can be increased, resulting in decreased cross-sectional areas to satisfy strength requirements. Whereas the working unit stress in tension for railroad-car design is usually specified as 16,000 psi. for structural steel, it may be as much as 24,000 or 25,000 psi. for high-strength steels.

In addition to weight saving from use of higher working unit stress, further weight reduction is possible by substitution of cold-formed sections for rolled structural shapes. This occurs when design thicknesses are less than minimum thicknesses of rolled shapes and recourse is had to shapes pressed or formed from strip, sheet or plates.

Weight Saving—25%

Experience has shown that weight saving will average about 25%, although it may be higher, depending on application and design. Such a substantial reduction in deadweight of freight and passenger cars can produce operating economies with greater payloads, safer braking and faster starts. Box-car bodies have been reduced in weight by as much as 8,000 lb., and 70-ton hopper cars by 10,000 lb. Some railroads, however, prefer a compromise between reduced weight and service life, where maximum weight saving is sacrificed to lower maintenance costs.

But lightweight design, especially in freight-car construction, is economically practical only when the steel is more resistant to corrosion than is ordinary structural steel. Otherwise, transportation savings will be absorbed by increased maintenance caused by corrosion.

The atmospheric corrosion resist-

ance of high-strength steels is considered by many metallurgists and design engineers as the most important property. Their resistance is from 4 to 6 times that of mild steel and from 2 to 3 times that of copper-bearing steel.

Addition of from 0.15 to 0.25% copper will reduce atmospheric corrosion by nearly 50%. More copper will show added improvement, but at a reduced rate, and may be undesirable, because of formation of a copper precipitate during cooling from rolling temperature. Addition, however, of other alloys further increases corrosion resistance. Phosphorus, for example, is considered an effective alloying element for improving resistance when copper is 0.35% or more, resulting in an increase of 25 to 30%. Likewise, chromium, nickel, silicon and molybdenum, in proper combinations and proportions, will increase corrosion resistance by their effect on adherence of the rust scale.

Corrosion resistance of high-strength steels is due primarily to the hard, dense, tightly adherent coat of rust that forms an exposure to a corrosive atmosphere. This scale, being nearly spall-proof, prevents exposure of fresh surfaces and so reduces electrolytic action.

Tests, both laboratory and service, have proved this superiority in corrosion resistance. Hopper and gondola cars offer good examples, as their load-carrying surfaces are exposed to the atmosphere more so than those of closed box cars. Observation by one railroad over a period of 10 yr. showed relatively little deterioration of high-strength hopper-car bodies and frames, there being no appreciable pitting and corrosion and no need for other than minor repairs.

Not only are most high-strength steels resistant to industrial atmospheres of corrosive high-sulphur fumes, but some are correspondingly resistant to salt-water and salt-water atmospheres. Subjected to a 10% brine solution for 180 days (sprayed twice a week), one particular high-strength steel showed a loss in weight of only two-thirds that of copper-bearing steel and one-half that of wrought iron. A sea-water test of another high-strength steel showed only a loss of one-fourth that of mild steel over a year's time.

Longer Paint Life

To effect greater resistance to corrosion for severe service conditions, these steels may be painted, bonderized or galvanized. Although painting methods differ to such an extent that there is little information available on comparative service life of paint on high-strength steels, experimental exposure tests indicate that life of iron-oxide paint on high-strength steels is about 40% and red-lead paint 100% longer than on plain carbon steel.

The superior corrosion resistance has a beneficial effect on the durability of paint coatings, probably because of better paint adherence and less pitting of the steel. Furthermore, repainting is facilitated by the smoother surface. The increased resistance, therefore, can reduce maintenance costs by extending the interval between repaintings, and is particularly desirable where local damage to the paint coating may occur in service and expose the steel to the atmosphere.

With galvanized surfaces, however, the characteristics of the base metal seem to have little effect on the adherence of the coating. Salt-spray tests, however, have shown that one high-strength steel, when hot galvanized, has remarkably superior resistance, probably caused by alloying of base metal and zinc. Furthermore, after the first bare spot appears, the improved corrosion resistance of high-strength steels prolongs the life of the structure.

Although high corrosion resistance and yield point are considered the most important properties of high-strength steels, in many structures the fatigue strength, or endurance limit, may be of prime importance. Where a structure or any part of it is subject to repeated loadings, the working unit stresses should be based on the endurance limit when it is less than the yield point. As a general rule for these steels, the endurance limit is approximately 60% greater than that of ASTM A-113 steel and 40% greater than that of ASTM A-7 steel. Some of these steels, however, have an unusually high ratio of endurance to ultimate strength, and consistently how endurance limits 65% greater than A-7.

In taking advantage of the high yield and fatigue strengths, a designer may meet the problem of elastic instability from use of high working unit stresses. The modulus of elasticity of all steels is practically constant, which means that a load will produce the same deflection in identical members, regardless of the kind of steel. Designing, therefore, to higher working unit stresses will result in deflections greater than those with plain carbon steel.

When such deflections must be kept within rather close limits to

RAILROAD HOPPER CARS, whether built new or repaired, will show definite saving in deadload weight with little difference in construction methods. *Courtesy of Bethlehem Steel Co.*

insure a rigid structure, the full weight-saving economy may not be realized unless special means can be adopted, such as increasing the depth of beams. But where more flexibility is permissible, in truck frames and bodies, full advantage in weight reduction can be taken despite the increased deflection. In cases where specified limits might preclude the possibility of any weight reduction, the design of the structure may possibly be changed to reduce the deflection. For instance, the weight on a member may be reduced, its depth increased, span decreased or restraining moments introduced at the ends of the span. Moreover, examination of specified limits may disclose that greater deflection is permissible.

These Steels Are Workable

The desirability of a steel for a particular application depends not only on its physical characteristics so far as the design is concerned. It depends too on the practicability and economy of fabrication, and the behavior of the steel as it passes through the fabricating processes.

High-strength steels are harder, and are commonly said to be "stiffer" than ordinary structural steel because of their higher yield point and the greater force required to produce permanent deformation, as in pressing or bending. The thinner sections required to meet strength requirements, however, offset the extra effort for permanent set.

High-strength steels, despite their greater strengths, meet fabricating requirements, as they have satisfactory workability and many have excellent weldability. While they cannot be worked as drastically as dead-soft steel, their forming properties are practically equal to those of mild carbon steel. In fact, they can be fabricated readily in the average shop without special facilities, but attention should be paid to machine capacity if they are working near their limits, as such ratings are generally based on mild steel.

The applications of high-strength steels are such that fabricating processes are usually limited to cold forming, hot forming, shearing, punching, drilling, reaming, coping, flame cutting, welding and riveting.

In cold forming, provisions should be made for a more liberal radius of bend, slightly increased die clearance and greater springback allowance than with mild steel. The inside radius of the bend should be not less than equal to the sheet thickness for gages up to 1/16 in., twice the thickness for gages from 1/16 to ¼ in. and three times the thickness for gages over ¼ in. Somewhat more severe forming is possible if done slowly and while the steel is not extremely cold.

Greater springback allowance is required because of the higher yield point and can be given by the usual methods. Dies may be designed to upset the material at the bend to offset elastic action, or to press the material beyond the required angle and let it spring back. Another method is to hump the bottom of the die slightly so the bottom will spring straight and draw the sides in when pressure is released.

Hot Form Over ½ In.

Hot forming, generally recommended when plate thickness is over ½ in., may be necessary for shapes, such as tank heads and car channels, for which cold forming is impractical. As high-strength steels are not air hardening, their mechanical properties are not affected by hot forming or pressing and heat treatment is unnecessary. Because of their toughness, these steels should be formed at temperatures between 1,500 to 1,600 F., approximately 200° higher than forming temperatures for mild carbon steel.

Both shearing and punching may be performed readily on high-strength steels, but greater force is required than for structural steel, approximately 20% greater than for ASTM A-7 and 40% greater than for ASTM A-113. Drilling and reaming likewise require greater force and,

Courtesy of Jones & Laughlin Steel Corp.

HIGH-STRENGTH STEELS are particularly adapted to applications where corrosion is a problem, as in smoke stacks and where fabrication by welding is desirable

ORE BARGE in service 8 yrs. shows comparative corrosion resistance. Mild-steel sheets are corroded nearly through while high-strength steel shows little corrosion.

Courtesy of Jones & Laughlin Corp.

Compositions and Properties of Low-Alloy, High-Strength Steels

TRADE NAME	C (max.)	Mn	P	S (max.)	Si	Cu	Cr	Ni	Mo	Zr	Al	Tensile Strength psi. (min.)	Yield Point psi. (min.)	Elongation in 2 in. % (min.)	Endurance Limit (as-rolled) psi.	Charpy Impact (ft.-lb.)
Aldecor	0.12	0.15-0.40	0.08-0.15	0.05	0.35-0.75	0.35-0.60			0.16-0.28			70,000	50,000	22	42,000	40
Armco 50Y	0.12	0.50-0.75	0.04-0.07	0.04	0.10	0.50-0.70		0.60-0.90				65,000	50,000	20	....	....
Armco 55Y	0.12	0.65-0.95	0.07-0.12	0.04	0.10 max.	0.50-0.70		0.60 0.90				75,000	55,000	15	....	....
Cor-Ten	0.12	0.20-0.50	0.07-0.15	0.05	0.25-0.75	0.25-0.55	0.50-1.25	0.65 max.				70,000	50,000	22	42,000	40*
Double Strength	0.12	0.50-1.00	0.04 max.	0.05		0.50 1.00		0.50-1.10	0.10 min.			70,000	50,000	22	42,000	40
Dynalloy (max.)	0.20	1.25	0.10	0.05	0.30	0.60		1.00	0.10			65,000	50,000	25	45,000	....
Hi-Steel	0.12	0.50-0.90	0.05-0.12	0.05	0.15 max.	0.90-1.30		0.45-0.75	0.08-0.18		0.12-0.27	70,000	50,000	22	50,000	55
Mn-Ni-Cu	0.25	1.50 max.	0.08 max.	0.05	0.25 max.	0.25-0.50		0.50-1.00				70,000	50,000	22	45,000	42*
Man-Ten	0.25	1.10-1.60	0.045 max.	0.05	0.30 max.	0.20 min.						75,000	50,000	20	40,000	30*
Mayari R	0.12	0.50-1.00	0.08-0.12	0.05	0.10-0.50	0.50-0.70	0.40-1.00	0.25-0.75				70,000	50,000	22	50,000	47*
N-A-X high tensile (Typical—½ in.)	0.13	0.70	0.02	0.025	0.80		0.60			0.11		76,000	52,000	40	62% of tensile str.	50**
Otiscoloy	0.15	0.90-1.40	0.08-0.13	0.04	0.10 max.	0.30 min.	Res	Res				70,000	50,000	25	....	35
Yoloy (High ductility)	0.12	0.60 max.	0.04 max.	0.05	0.30 max.	0.75-1.25		1.50-2.00				65,000	48,000	25	45,000	120***
Yoloy (Intermediate)	0.18	0.80 max.	0.04 max.	0.05	0.30 max.	0.75-1.25		1.50-2.00				75,000	56,000	22	51,000	105***
Yoloy (High strength)	0.24	1.00 max.	0.04 max.	0.05	0.30 max.	0.75-1.25		1.50-2.00				85,000	64,000	18	57,000	90***

**As-rolled, keyhole notch at room temperature.* ***Keyhole at 75° F.—transverse.*
****According to ASTM specification E-23-34T, 10 x 10 mm. with 8 mm. under V notch.*

as a result, should be done at speeds about 25% less than those ordinarily recommended for mild carbon steel.

Welding is considered by far the most important fabricating process on high-strength steels, because they are readily welded by all usual methods and welded construction aids weight reduction by elimination of overlapping seams and joints. As welding involves intermingling of base metal with electrode or welding-rod metal, composition of these steels should be adjusted to keep weld hardenability at a minimum. The usual low-carbon content, not over 0.12 to 0.15% max., minimizes weld hardenability, even in heavier sections, although with greater thicknesses, over ¾ in., the weld-quench effect may be so increased as to require preheating to reduce thermal gradients. Preheating may be especially necessary when welding at low temperatures or when fabricating dynamically loaded structures.

Metallic-arc welds can readily be made with coated mild-steel or high-strength electrodes. Uncoated electrodes deposit metal neither ductile nor strong enough for high-strength joints.

Mild-steel electrodes, in most cases, are satisfactory as the welds, even ground flush, may have strengths greater than that of the base metal.

When the base metal melts and mixes with the weld metal, strength of weld metal is increased, depending on the number of layers deposited. Where greater strength is required in the weld and in some cases where the bead is ground flush, high-strength electrodes are recommended.

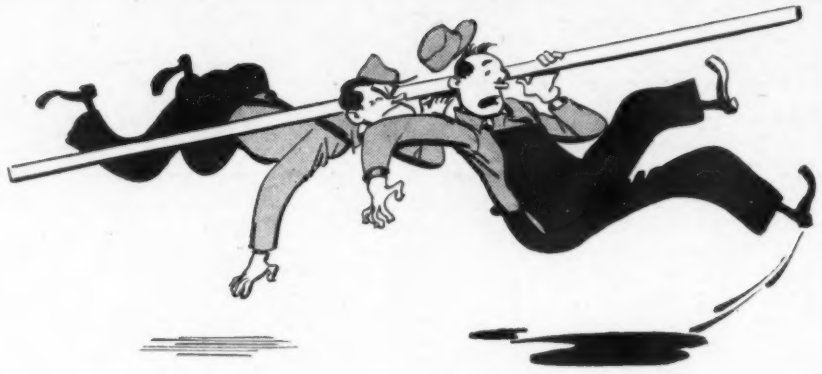
One steel manufacturer recommends the American Welding Society (A.W.S.) Grade E-6010 for all-position electrodes, A.W.S. Grade E-6020 and E-6030 for position or fillet electrodes and A.W.S. Grade E-6012 for joints where fit-up is poor and cannot be remedied. Welds made with such electrodes should have an ultimate tensile strength of 70,000 to 85,000 psi.

Welding technique is similar to that for mild steel. Somewhat greater care should be taken to offset distortion, as high-strength steels are not so able to adjust themselves to distortion stresses. Assemblies should be planned to permit free movement of parts in shrinkage, multiple beads may be laid to reduce heat generated and base metal may be preheated to help distribute the distortion.

High-strength steels may be oxy-acetylene welded, but mild-steel rods are not recommended as they deposit metal of insufficient strength. High-strength rods (ASTM A251, CA65) or shearings from sheets or plates are satisfactory as filler metal.

These steels may be spot-, seam- and flash-welded as readily as mild steel, but the weld strength is considerably greater than that of a mild-steel weld of the same size. For thicknesses under ⅛ in., the pressure, current and time can be made the same as those given in the A.W.S. bulletin "Recommended Practices for Resistance Welding (Tentative-1946)" for low-carbon steel (SAE 1010). Greater thicknesses require increased pressures, reduced amperage and longer cycles.

Modern practice presents few difficulties in machine settings, distortion or strength. Multiple-spot machines, for example, have been developed to weld stiffeners to interiors of car sides at speeds considerably higher than is possible with single-spot machines.



Floors should be kept clear of grease

SAFETY at the Power Saws

Personnel selection, stockroom layout, materials handling and work clamping are the principal danger sources in handling bars

BY BENJAMIN MELNITSKY

CONSTANT HAZARD in power saw and bar stock departments can be appreciably reduced by planned safety campaigns. As power saws are the initial operation in the production cycle of many parts, safety measures prevent costly tie-ups and ensure a steady flow of materials. Experience has shown that accidents slow up not only the department immediately involved but also all adjacent departments.

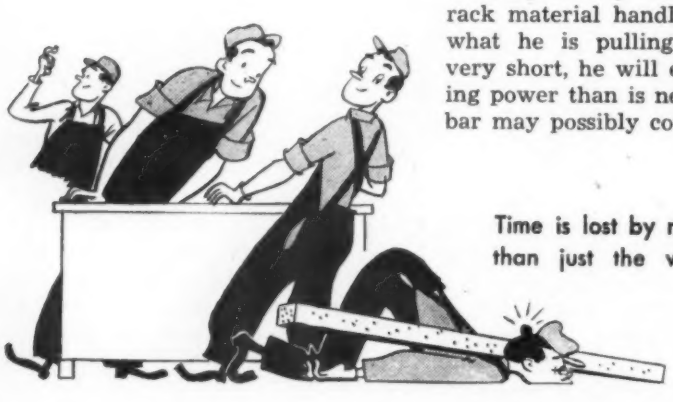
Safety problems in the bar stock department are generally three-fold: getting the bars safely out of the rack, moving them from racks to saws, and placing work on the saws and sawing the stock.

First consideration in a safety program is the man who handles the work. Psychological tests indicate that there are certain people to whom the incidence of accidents is far greater than normal. They often can be detected from previous employment records during the screening given by the personnel department. A man with a bad accident record is a better-than-average candidate for future accidents.

People physically incapable of handling heavy bars are dangerous both to themselves and their fellow workers. Men who handle bar stock and operate power saws should be physically sound and mentally alert, should be aware of the dangers inherent in the job, and should know how to handle bars.

Men who work in the department should be of average height, because a very tall man cannot work well with an average man. Watch a tall man (or a very short man) carry a bar with a man of average height as a partner. The pace is ungainly, the load balanced unevenly and the carrying position awkward. Tall men should be teamed with tall men, short men with short men.

One of the greatest danger areas is at the bar stock rack. An elementary safety rule is that the rack material handler should know what he is pulling. If the bar is very short, he will exert more pulling power than is necessary and the bar may possibly come out fast and drop on his shins or instep. If the bar is heavy, the material man may injure himself if he tries to work on it himself. Size and length of bars should be examined before pulling.



Time is lost by more than just the victim

To be moved easily and safely bars should be staggered in the rack, each row of bars extending out over the row below. If bars are racked evenly, each bar must be raised above the other bars, grasped and then pulled out slightly. Bars extending from the rack can be got hold of easily. Ample space should be allowed behind the rack so that bars can be pushed out from the back. It is much easier to push a bar out of the rack than attempt to overcome the initial inertia by pulling it. If these two steps are followed, hooks, grapples and other devices will not be needed for the initial pull.

Once the bar is partly out of the rack it should be handled by material-handling equipment rather than by manpower alone. A sling should be attached to the projecting end of heavy bars and the bar pulled out by several men or by a hoist or fork truck.

Smaller bars can be handled by hand. However, two men should always be used in pulling stock—one man to pull the bars out of the rack and the other to receive the bars. When bars are being pulled from the rack there should always be a place to drop the stock—a wagon, a skid, dunnage or the forks of the fork truck.

The fork can serve well when bars are being pulled. The truck is stationed parallel to the rack between the man pulling the bars and the man receiving them. Forks are raised level to the rack and the bars are dropped onto the forks as they are pulled from the rack. The forks of the truck should be tilted back and the bars centered on the forks. As in all types of work in this department, fatigue should be cut down by switching men periodically from tiring jobs to those that are less tiring.

If a hoist is used to pull bars out of the rack, definite safety factors must be considered, principally in the hoist itself. The chains, slings, hooks, hoisting devices and accessories should be in good condition and checked periodically. A weak chain or frayed sling is highly dangerous and should be discarded or repaired as soon as discovered.

Rope or wire-strand slings should be used with hoists in preference to chains as they provide a firmer grip on the bar and eliminate the possibility of the bar slipping or falling. If chains are used, the links should be small and slip hooks should be employed.

Layout of the storeroom and its relation to the power saws has a great deal to do with safety. If storerooms are widely separated, the safety problem becomes more complex. Racks and saws should be as close together as possible and should be connected by traveling hoists. The smaller the area over which the bars travel the less the danger of accidents.

Where the area is great, bar stock should be carried on specially designed wagons. In these units there is usually a space between the bars and the bottom of the wagon for the fork of the fork truck or the chain of the hoist to be inserted, preventing the bars from rolling off such wagons. Wagons are more desirable than fork trucks for long hauls and the path of travel is determined merely by width of the wagon. With the fork truck, the path of travel is governed by the width of the longest bar.

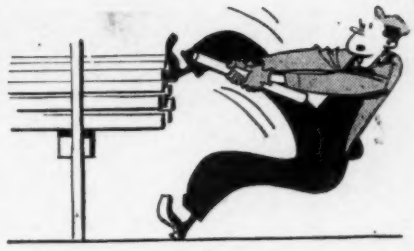
Safe storage space should be provided around power saws for temporary storage of bars to be cut. As one bar is cut, it is replaced by another bar. Pulling one bar at a time from the rack, cutting it and closing the saw till the next bar can be pulled is wasteful and slows up work in the department. Bars waiting to be cut should be stored on dunnage or in racks, never flush on the floor or leaned against the floor boards of the saw.

When bars are being placed on the saw, the saw should be open, ready to receive the work. The arm of the saw should be raised as high as possible and the chuck pushed away from the back plate. If this is not done, the saw will have to be prepared for the bar while the bar is hanging in midair.

Stands should be set in correct positions before bars are placed on the saws. They should be located so that bars will not tip when put on the saw. Stands should be used for even the smallest bars, as an unsupported bar may fly up and break the blade when the chuck is loosened. If the piece being cut is long it should be clamped to the table to prevent the cut bar from rolling and falling to the ground.

Two men should be used in loading small diameter bars on saws, one man at each end of each bar being put into a saw. Larger bars should not be handled by manpower alone but by a hoist or fork truck.

When putting bars on the saw with hoists, one man should operate the hoist and one or more men guide the bar into the machine. Heavy bars should be positioned accurately before being dropped on the table of the saw. Fouling of the chain or sling under the bar or contact with the saw table can be prevented by using two strands and positioning them at the ends of the bar.



Find out what you are pulling from the rack

When placing heavy bars on the saw from a fork truck one man should be at each end of the bar to guide and control it into the machine. Truck forks should be spread as far apart as possible so that they will clear the saw when the bar is dropped into position. If the saw is too wide for the forks the chuck and everything else should be taken off the saw table and the bar rolled gently off the forks onto the saw. All impediments should be cleared from the floor so that fork trucks will not lurch and lose their loads.

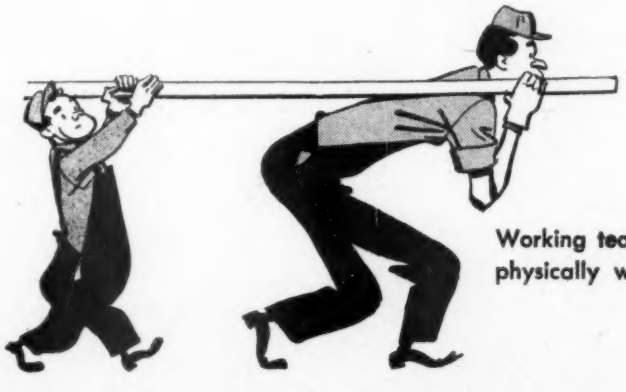
Once bars are on the saw and in proper position for the cut they should be chucked tightly. If several bars are being cut at one time they should be held firmly in place by special jigs, fixtures or holding devices.

A skid or receptacle should be on hand to receive pieces as they are cut. Cut pieces left on the floor or saw table create danger.

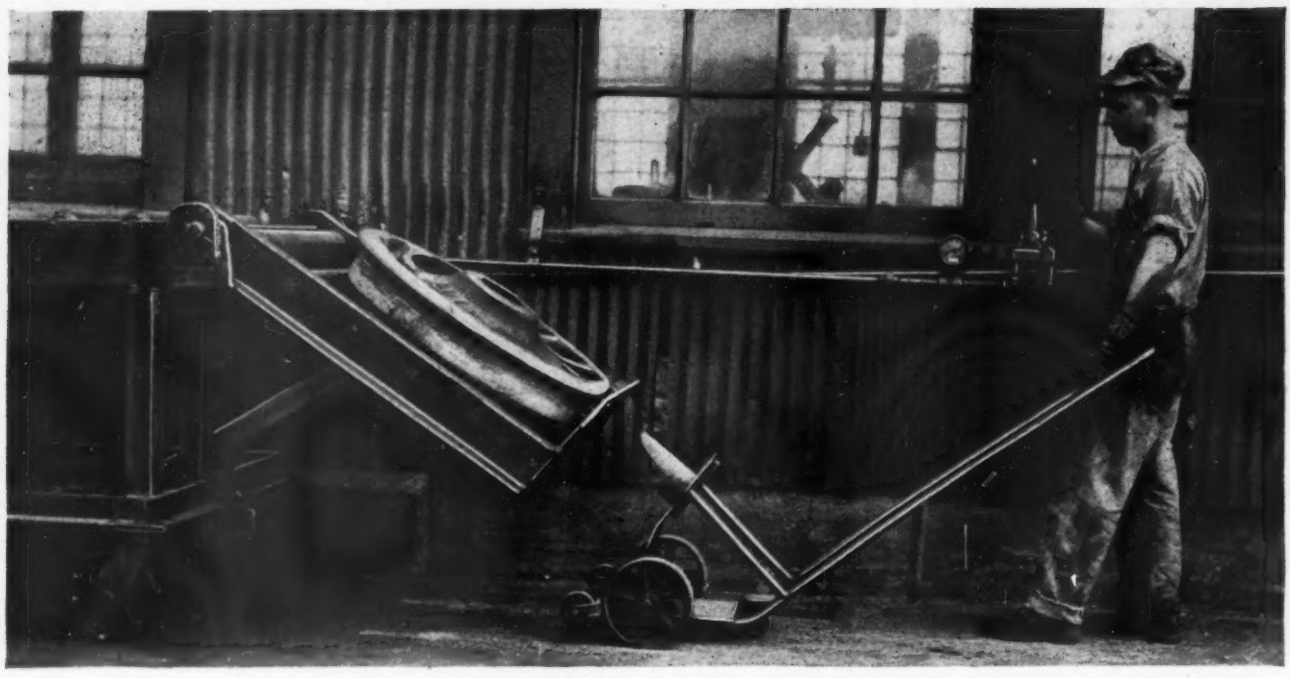
Oil or grease on the floor should be covered with saw-dust or some drying agent and leaks should be reported as soon as discovered. Trucks that leak oil and hoists that drip oil should be kept out of the saw room until they are repaired.

Cutting solutions and solutions that injure men's hands and cause skin diseases should not be used. New solutions should be used only after this tendency has been checked.

Men who work in this department should always wear safety shoes that have steel-capped toes. An ample supply of work gloves will prevent accidents and metal pickup resulting from frayed and pierced gloves. Attention to such apparently minor details are a part of any effective safety program in the power saw and bar stock departments.



Working teams should be physically well matched



Wheels from storage are loaded by a special wheel dolly on an air-operated elevator section of the portable roller conveyor leading to the shop

Car-Wheel Maintenance Mechanized...2

Mechanized wheel handling and specialized shop equipment aid efficient maintenance

BY LAWRENCE W. SAGLE

HANDLING OF WHEELS at the Pittsburgh Glenwood wheel shop of the Baltimore & Ohio Railroad is as mechanized as the handling of axles.

New wheels received from the manufacturer in gondolas are unloaded at storage by a diesel locomotive crane. Wheel rollers then move them to bins where they are stacked according to tape size to facilitate matching into pairs. When needed, the wheels are placed on portable roller conveyors leading from storage direct to the boring mills.

Until recently, wheels were loaded on conveyors by a crane truck, requiring an operator and helper. But a new type of wheel dolly has been designed so one man can pick up a wheel and deliver it to an air-operated elevator section on the end of the conveyor. Depositing the wheel in an upright position, the operator raises the elevator section by an air cylinder mounted beneath the conveyor and operated by an air valve set back to clear the lift, but close enough to save unnecessary movement on the part of the operator. When the elevator section is in top position, the wheel rolls along the conveyor to the shop and boring mills.

The wheels are bored on two Niles plain hydraulic-feed wheel borers, equipped with 5-jaw chucks and arranged for handling carbide tools, with hub-facing attachment operated by hydraulic feed and traverse. They are also equipped with table brake and automatic feed attachment. The boring bars are Davis No. 7½ special two-in-one with A and B cutters.

Each boring mill is served by right-hand and left-hand cranes. The wheels are picked up from the conveyor by the crane on the right and placed on the bed of the machine. After the wheels are bored, they are removed from the machine by the crane on the left.

The chart, mentioned previously as being made up at the axle lathes, has been supplied to the boring-mill operators. All the wheels are bored to the specified chart sizes, with proper tolerance allowed to obtain the required mounting pressure. Roughing and finishing cuts are made in one operation. Cast-iron wheels are bored at a speed of 125 rpm., and steel wheels at 125 rpm. for the roughing cut and at 39 rpm. for the finishing cut.

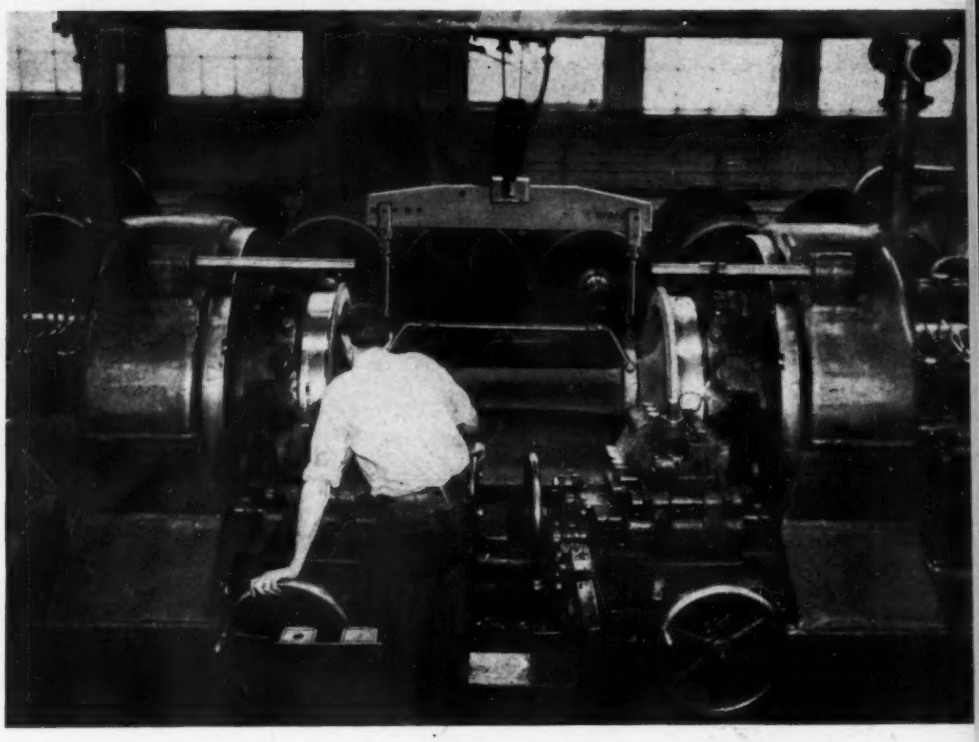
All boring tools have been designed to operate at least 8 hr. without regrinding, and in one case, with carbide boring tools, 2,186 cast-iron wheels were finish-bored without regrinding the tool. The output of the two boring mills is 80 cast-iron or 50 steel wheels per day.

Wheels and axles are now ready for mounting. As each pair of wheels comes from the boring mills, they are placed on the roller conveyor inside the shop. Each wheel is marked with the date and station symbol. The matched wheels are picked up by crane, using especially designed hooks, and swung into vertical position at the mounting press on dollies which run below the floor level

like those at the stripping press. The axle with the corresponding number is then selected and swung by crane from the rack to the axle jack that raises or lowers the axle so the wheels can be pushed on over the journals. Collets are placed over the journals to protect them, and wheel seats are painted with a mixture of white lead and boiled linseed oil.

After the wheels are on the axle, the jack is lowered and they are rolled from the dollies into position in the mounting press, a reconditioned 400-ton Niles-Bement-Pond that can handle 80 pairs daily.

The left wheel is pressed on first. When the ram is released, a pneumatic plunger engages the left end of the axle and slides the wheels to the right. The end of the axle is then blocked at the left, and the block is removed from the ram at the right, allowing the ram to come in contact with the right wheel which is then mounted. During the operation, one point of the measuring caliphers is held against the wheel and the operator stops the press when the opposite point reaches the marked center of the axle.



Tread-truing lathe has two compound tool slides for turning both treads at once. Operating at 17 fpm., output is 11 pairs in 8 hours

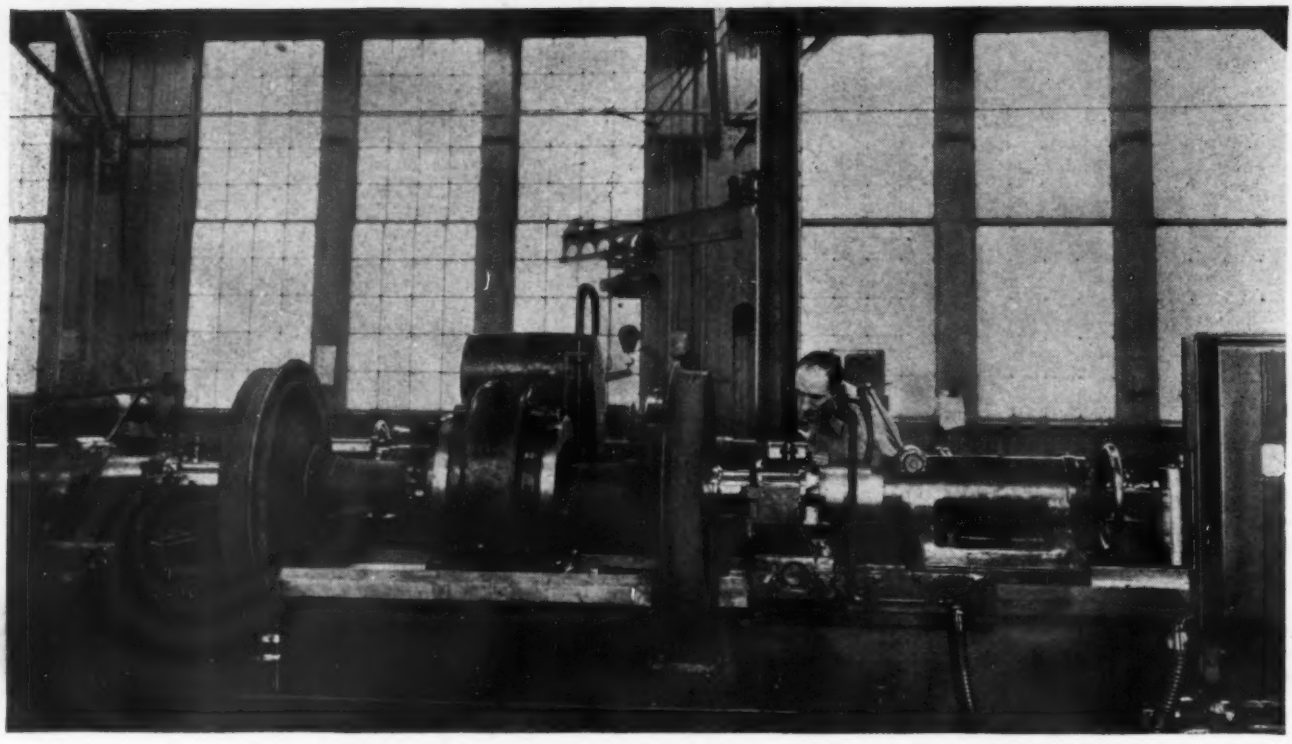
Different types of wheels are mounted at different pressures. The pressure is registered both on a gage and on a tape. The operator marks the serial number of the wheel and the date on the tape, which is kept as a permanent record. Should any question come up later about any wheel, the tape can be consulted to determine the mounting pressure.

After the wheels are mounted, the collets are removed from the journals and the wheels are rolled through to the opposite side of the press. There they are either loaded, with a 3-ton tramrail crane with electric hoist, onto wheel cars inside the shop, or transported by dolly to outside storage tracks from which they are loaded on cars by the diesel crane.

Also included in the equipment of the shop are a journal-truing lathe and a wheel lathe. The journal lathe is a Betts-Bridgeford gap-type,

Wheel boring mill has two integral cranes, one for placing work in the chuck and the second for unloading wheels to conveyor

Finished wheels and axles are brought to the mounting press by conveyors. Special hooks pick up the wheels in a vertical position for placing in press



Double-end, gap, journal-truing lathe, carbide-tooled, can handle two pairs of wheels per hr. The burnishing attachment on each carriage is the opposed type

CAR-WHEEL MAINTENANCE
(continued)

double-end lathe, each carriage equipped with opposed type burnishing attachment and roller-bearing built-in type Timkenized tailstocks. Speed changes are 30-47-52 rpm., and four feed changes range from 0.0137 to 0.046 in.

Wheels requiring truing of journals are rolled direct to this lathe on a track and handled in and out of the machine by a 3-ton tramrail electric hoist. The lathe is carbide tooled, and the output is 16 pairs of wheels in 8 hr., both ends of each pair being machined and burnished.

When a pair of mounted wheels needs the treads turned, the operation is performed on a Sellers 50-in. wheel lathe, type RB, with two compound toolslides, each equipped with a smooth-finish tool holder taking four tools, and with hardened steel inserts under fixed forming tools. The lathe operates at a cutting speed of 17 fpm., and the output is 11 pairs of wheels in 8 hr.

All the tooling in the shop is in triplicate. While one set of tools is in use, another set of resharpened tools is in the rack ready for use, and the third set is in the toolroom being resharpened to predetermined clearances. Thus, properly sharpened tools are always available, and replacements are carried on hand in the storehouse.

OPERATION DATA

Operation	Equipment	Average Floor-to-Floor Time in Min.	Cutting Tools
Dismounting wheels, pairs	Chambersburg 600-ton press	4	——
Mounting wheels, pairs	Niles-Bement-Pond 400-ton press	6	——
Turning steel treads, pairs	Sellers 50-in. type R.B. wheel lathe	44	High-speed steel (18-4-1)
Truing & rolling journals mounted, pairs	Betts-Bridgeford double-end lathe	30	Carbide for cutting: Stellite rolls for burnishing
Truing journals & wheel seats, second-hand axles, pairs	Niles #3 type double-end, center-driven lathes (3) Betts-Bridgeford double-end, center-driven lathe (1)	32	Carbide for journals; high-speed steel (cobalt) for wheel seats
Burnishing journals, second-hand axles, pairs	Niles double-end burnishing lathe with opposed rolls	10	Carbide for roughing and finishing
Boring steel wheels, each	Niles plain hydraulic-feed wheel boring mills with table brake and integral cranes (2)	9	Carbide for roughing; high-speed steel (18-4-1) for finishing

The new machinery and the crane-conveyor system for handling wheels and axles is effecting a saving of 30%, or 2,630 manhours per month, equivalent to $3,347, including shop expense, or a total amount saving of $40,164. This is exclusive of the savings effected by the decreased cost of maintenance required on the new machines as compared to that of the old machines previously in use. As the amount expended on the new shop was $215,251.00, machinery $184,676 and building changes $30,-575, the cost of the new project will be amortized in 5 1/3 years.

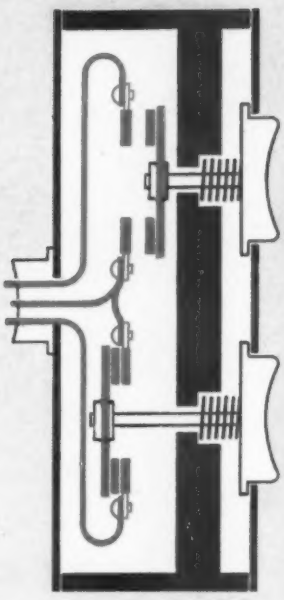
Electric Control

FOR METALWORKING MACHINES

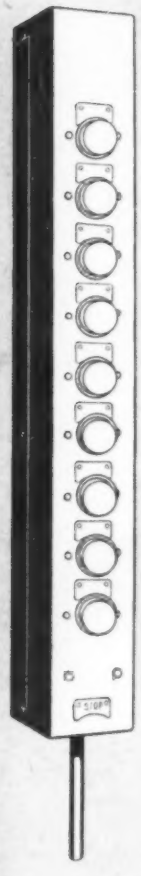
BY JAMES VAN VOAST
ASSISTANT EDITOR

TODAY'S metalworking tools are producing more than ever before, and it has taken intensive research into every branch of science and engineering to achieve this. Better tools, better materials and better machines deserve much of the credit, but the production process can be no more efficient than the electricity that makes things turn, and the control system that regulates the electricity. Quick-action is almost synonymous with electricity, traveling at the speed of light, and here is its big contribution. Modern control "brains" not only cut dead time and lost motion to the bone, but they relieve the human brain of all routine responsibility, making the machine do its job almost entirely without supervision.

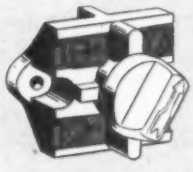
★ AN American Machinist REPORT TO THE METALWORKING INDUSTRIES ★

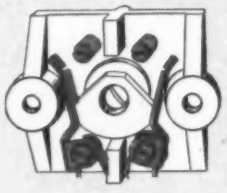


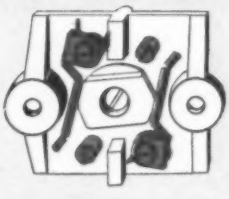
TYPICAL 2-BUTTON start-stop station is provided with a heavy case which can be mounted in anywhere. Knockout panels allow for connection to conduit



PENDANT STATIONS for large machines permit the operator to carry the control right where he needs it so he can stop the machine at precise locations. A wobble stick in the bottom makes instant emergency stops possible







MANY circuit combinations are possible in pushbutton switches. These are rotary selectors to switch from hand to automatic

IN THE OLD DAYS, labor was cheap but tools and the power to run them were expensive. When machine shops first came into existence, one prime mover sufficed for the whole plant. Sometimes the shop was located near a source of water power, or, if that wasn't feasible, a steam engine was the thing. Then electricity began to compete; the steam engine was replaced by one large electric motor.

Some shops still find it profitable to operate with one large motor, powering all machines through overhead shafts, pulleys and flat belts, as long as all machines are operating at full capacity most of the time and the work is of an unvarying nature.

Nearly every machine, however, must be loaded and unloaded. This requires stopping and starting some of its components. All feeds, whether tool or work, must be reversed and usually the piece requires some kind of complex cut, requiring further modificiations. In other words, most metal cutting is cyclical in nature, so adjustable transmissions are always needed.

From the one-motor-per-shop days, things progressed to one motor per machine. This eliminated much of the shafting, pulleys and belts, and made it possible to operate the machines individually and intermittently with more economy. But most machines still had the 3- or 4-step cone pulley on the spindle and were driven by a flat belt, whether the motor was bracketed to the machine or mounted directly overhead. The next step incorporated the motor within the machine, coupled to the machine spindle or gearbox with V-belts or a flat belt. It was some time before motors were coupled directly to the gearbox or spindle.

Many simple and general-purpose tools still derive power for all functions from one motor. If necessary, various take-offs power the feeds and attachments.

But modern high-production manufacturing is constantly demanding more and more tool efficiency with the result that the electrical horsepower per tool has greatly increased and is still increasing. Heavier cuts require more power in the drive and better lubrication and cooling. Instead of building heavier transmissions for spindle and feed drives and adding more transmissions to power the lubricant and coolant pumps, individual motors, one for each job, are being installed. Now, it is common to find a single machine incorporating ten or more motors.

This introduces a major problem: how to regulate all this new power. Insofar as possible, the trend has been to gain the flexibility in speed and direction either through hydraulics or within the motor itself.

Let's consider the evolution of the all-important controls. The first large motor installation had only to be started once a day. It then ran continuously in the same directon at constant speed. All speed-changing, starting, stopping and reversing of the many elements of the various machines was accomplished mechanically. Gradually, as more and more motors appeared, control responsibility was shifted from mechanical to electrical means.

The over-all result is pushbuttons. Control stations now can be placed anywhere. In fact, the pushbutton panel is often repeated in several convenient locations on a large machine, or mounted in a flexible, portable pendant. Pushbuttons not only start and stop all the machine functions, but set up various combinations of automatic cycles as well.

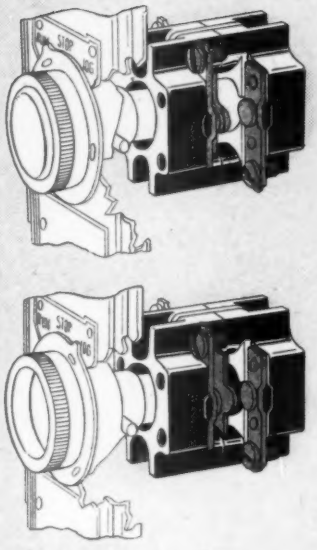
On the following pages will be found some of the whys and wherefores of the devices that make foolproof and efficient pushbutton control convenient to use.

Circuit Elements

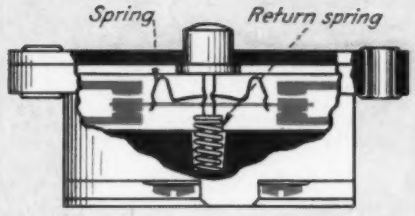
Machine-tool drives require a lot of power. Manual devices for regulating the flow of large currents have many drawbacks; they are heavy and must be rigidly mounted as near the motor as possible, and it takes a lot of skill to handle the equipment efficiently and safely.

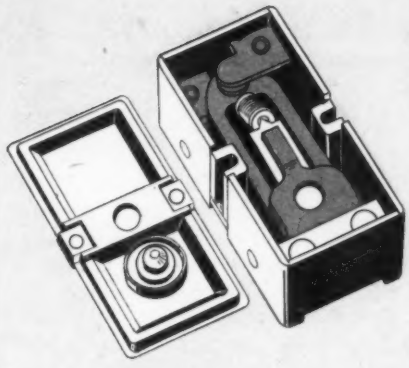
Whenever a motor (or motors) must be started or stopped more than once a day, the control is usually put into the hands of *other* electrical devices which are small, operate on low currents, can be mounted anywhere, and do their job automatically.

Pushbuttons — All intricate operations, whether full-automatic cycle or strictly manual, on most modern tools are now controlled with a row of buttons mounted wherever convenient, sometimes even in a flexible pendant station. Manufacturers of these pushbutton units and stations have so standardized their lines that almost any array can be assembled to perform any job for any machine. Any unit can be mounted in any part of the housing, and several types of buttons can be mounted

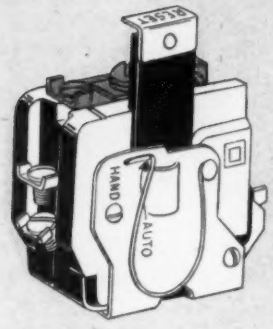


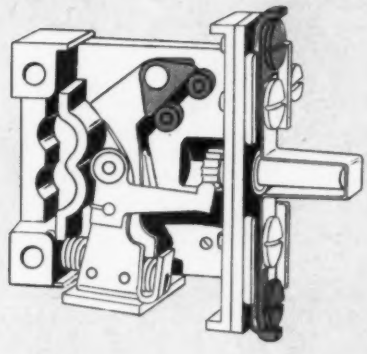
JOG ATTACHMENT is a collar and barrel cam which holds buttons partially depressed, below, but allows button to function normally when turned to left, top

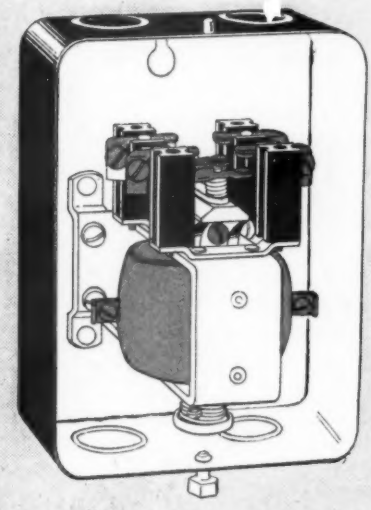




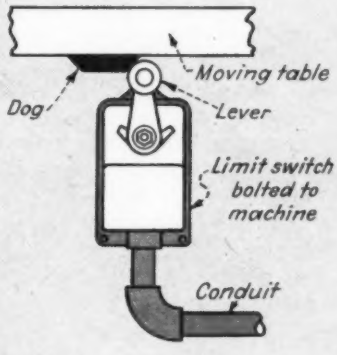
PRECISION SNAP SWITCHES operate with only a few thousandths of an inch plunger travel. An elliptical spring, working like a toggle, moves the contact as much as 1/8 in. when tripped



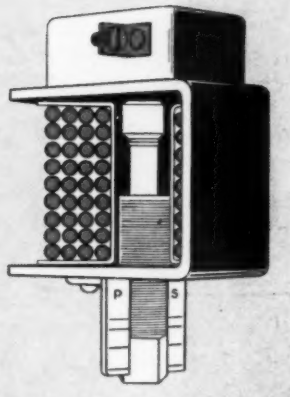




SOLENOID-TYPE RELAY with normally open contacts. When the coil energizes, it lifts plunger against gravity closing two double-break contacts



HEAVY-DUTY LIMIT SWITCH in a typical application is tripped by a dog on the machine part

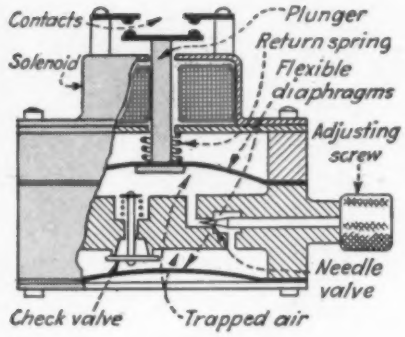


OVERLOAD RELAYS are circuit breakers. Electrical energy is converted into heat. When this becomes excessive, the contacts are tripped open. Heat in the two upper types comes from high resistance; in the lower one, it's inductance

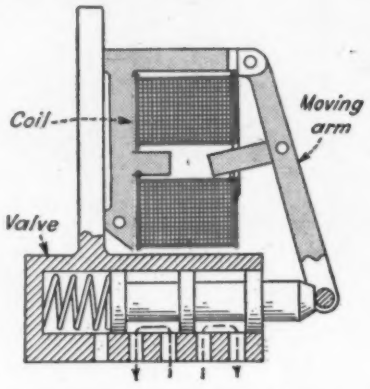
on the outside. Housings, too, vary to suit different requirements of installation and the type of protection desired. "General purpose" and "heavy duty" are the terms applied to the two most used types.

"Pushbuttons" are really glorified doorbell switches, but designed to meet the standards of industrial operation. The idea is that the momentary contact will give the magnetic control device the time to operate, then "holding" circuits within the magnetic device will maintain the desired function electrically until the stop button or other pilot device breaks this circuit somewhere. The advantage of this method is that control is not restricted to any single station. Several pushbutton stations for the same machine can be in-

TWO ELECTRO-PNEUMATIC POSSIBILITIES



PNEUMATIC TIMING RELAYS, working on the restricted orifice principle are used to delay the closing or the opening of circuits



MAGNETIC AIR VALVES are essential to the automatic operation of electrically-controlled, air-powered chucks, vises and cutting tools

stalled at convenient points and the motors can still be controlled by other automatic pilot devices as well, without interfering with each other.

Like nearly all industrial switches, most pushbuttons have double-break contacts in each leg of the circuit; thus the circuit is really opened in four places at once, and contact burning is reduced to the minimum.

Some units have more than one set of contacts in order to control two or more circuits. Some, by means of an external adjustment can be made to do two different things with the same circuit.

Maintained-contact switches also have a place in control and they usually appear with the pushbuttons in the control station. They are used as selector switches to pick out certain circuits from others.

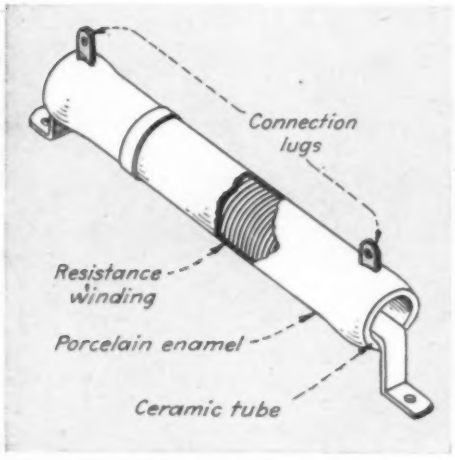
Limit Switches—Often the machine must be stopped, or reversed in relation to some position of one of its mechanical parts. A limit switch, then, opens and closes the necessary control circuits when the machine element strikes and operates its moving member. Limit switches usually differ from ordinary pushbuttons in that there is a snap action. A hand-operated button can have a long stroke. A snap-action limit switch makes a quick, positive opening or closure with as little as a few thousandths of an inch plunger or lever travel and therefore provides consistent results.

Relays—To be accurate technically, a relay is an electrically operated switch. The change in flow of a low current (called a signal, pilot or control current) can be made to operate an electromagnet or solenoid whose moving element will make and break the power circuit or circuits. Motion of this plunger or clapper can be timed in various ways so a sequence of closings or openings is set up which will perform many combinations of complicated circuit changes. The "amplification" factor of a relay—the ratio of the power current it switches to the magnet-operating current—may be from 10 to 100, depending on the efficiency of the magnet, and, of course, the requirements of the circuit.

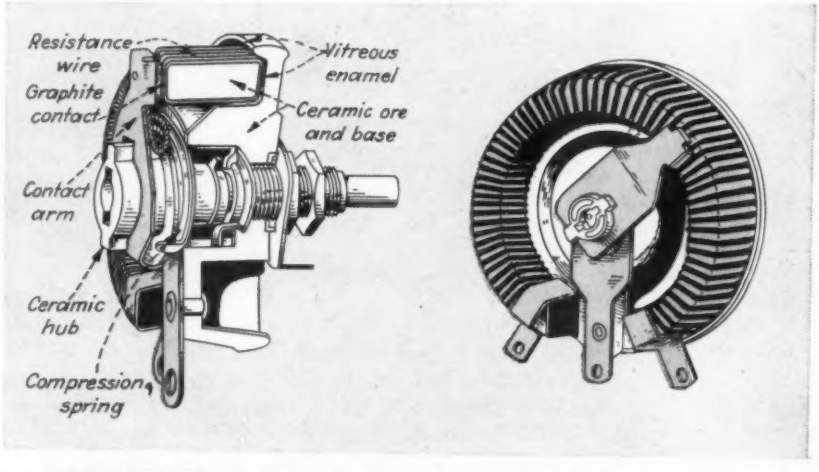
Relays have many specific uses in machine-tool control, and standard designs of relays for many special purposes are available. Typical examples are the plugging relay used to bring an induction motor to a quick stop by field reversal, the protective relay that opens the circuit if motor current becomes excessive, and several types of time-delay relays, and magnetic switches.

Current "Changers"

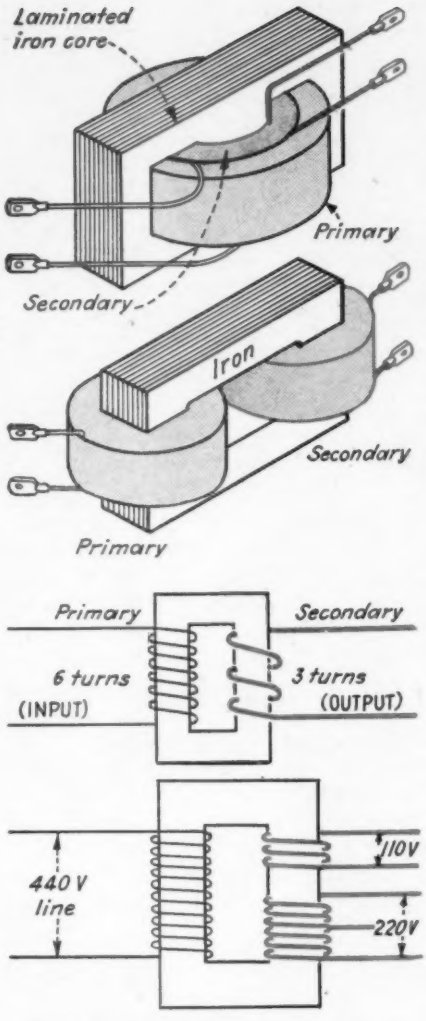
Unless there is both ac. and dc. electrical power at several voltages distributed throughout the plant, it is necessary to provide means to change some of the power which drives the machines into "control" power. If ac. must be changed to dc., a "converter" is used. This may be either rotary, in which case it's a motor-generator or a dynamotor, or a rectifier, which is static. If dc. must be changed to ac., the device is an "inverter." Rotary inverters are also either motor-generators or dynamotors, the distinction being that an M-G is two machines coupled together on a common base, but a dynamotor combines the job into a single armature with two commutators. The other inverter is a vibrator. This works like a buzzer: a



FIXED RESISTORS are used to reduce voltage or current in a circuit



RHEOSTATS of this type adjust power up to 1000 watts, for field control. Electronic circuits employ its miniature counterpart



TRANSFORMERS usually have both coils wound on a center leg. With a 2:1 turn ratio, output voltage is halved and current is doubled. The center tap simplifies rectification

magnet is actuated and reversed by its own contacts and reversals induce an alternating voltage. The ac. voltage depends on the number of turns in the coil, and the frequency depends on the mechanical period of vibration.

Resistors—Electrical resistance is like mechanical or hydraulic friction. All conductors have finite resistance, and this is usually kept to a minimum in circuits, because, like friction, it dissipates power in heat. There are times when its presence is necessary. The fixed resistor in an electrical circuit serves a purpose very similar to that of a reducing or pressure-regulating valve. The fixed resistor reduces voltage by consuming and deliberately dissipating some of the power into heat. Resistors are usually made of wire or ribbon that is a poor conductor wound into a compact coil on a porcelain core. The unit must be mounted where there is a free circulation of air to carry away heat.

Rheostats and Potentiometers—All electrical speed control is accomplished by varying a current in the main power circuit, either directly, or through the variation of a small control current. Either job can be done with a rheostat. From the small volume control in a radio receiver to the controller of a large crane or industrial electric truck, it's still a variable resistor, and the same principles apply.

In machine-tool control, there are two specific uses for rheostats that stand out. Adjustable-speed dc. motors require a field rheostat and an accelerating rheostatic starter if operated directly from a dc. line. For adjustable-speed drives operating from an ac. line, there are always small rheostats and potentiometers to adjust the pilot currents.

The distinction between a rheostat and a potentiometer is that the potentiometer is connected across a line, making it a fixed resistor; then its sliding arm adjusts the potential at the arm between two definite limits when the sliding arm is not drawing current.

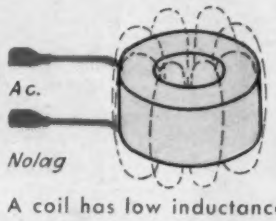
It is now common practice to operate all control devices at one voltage, such as 110 volts, and this means that transformers are needed to step down the power line voltage for this service.

Transformers—A transformer consists of a stack of thin iron plates, usually rectangular with a large hole cut out of the center. Two coils of insulated wire are wound on the iron: one is the "primary," the other the "secondary." Ac. from the line flows in the primary, and its oscillating action sets up a rapidly reversing magnetic field in the iron. This change in "flux" in turn induces a voltage in the secondary winding. The ratio of voltage across the primary to that across the secondary depends only on the number of turns in each winding; half as many turns on the secondary produces only half the voltage (exact) but almost twice the current.

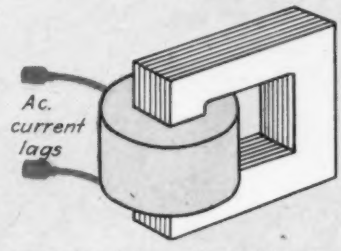
Losses in a well-constructed transformer are very small. Many control transformers require several secondary voltages. These can be obtained by tapping the one winding at various places or by winding several coils on the same iron. Often, too, a center-tapped secondary is advantageous, particularly for use in connection with rectifiers.

Reactors—In ac. circuits, besides resistance, there is another phenomenon which affects the flow of current. This is called reactance. It may be either inductive or capacitive reactance, but the inductive reactor is used much more in industrial control (while the variable condenser which selects radio stations is an example of capacitive reactance). We know that current flowing along a conductor creates a

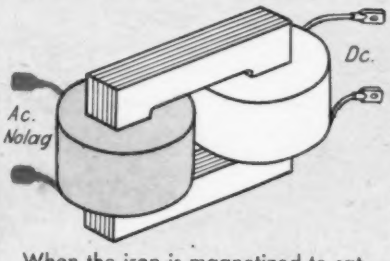
THE SATURABLE REACTOR



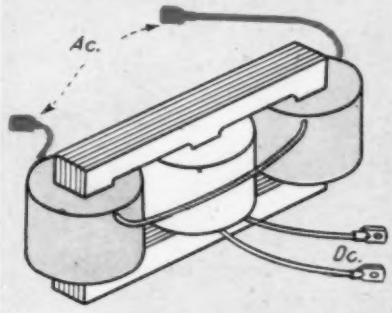
A coil has low inductance in air



Looped with iron, the coil has 1000 times as much inductance

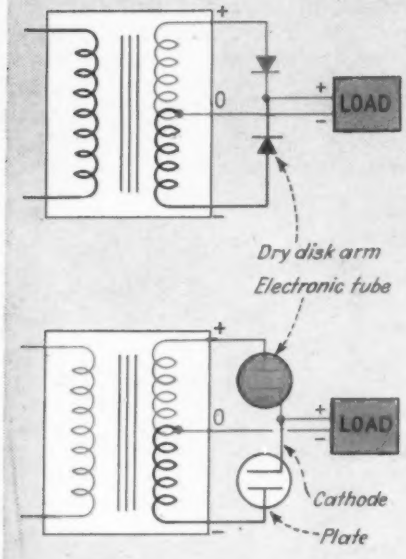


When the iron is magnetized to saturation, the inductance is low again. When the dc. is off, the inductance is high and the dc. coil will become the secondary of a transformer

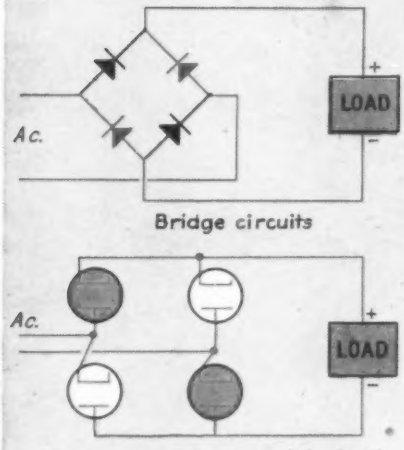


Here, the ac. coil is split into two opposed coils to kill the transformer action. Thus, a small dc. coil can vary a larger ac. circuit, regulating the current without changing the voltage

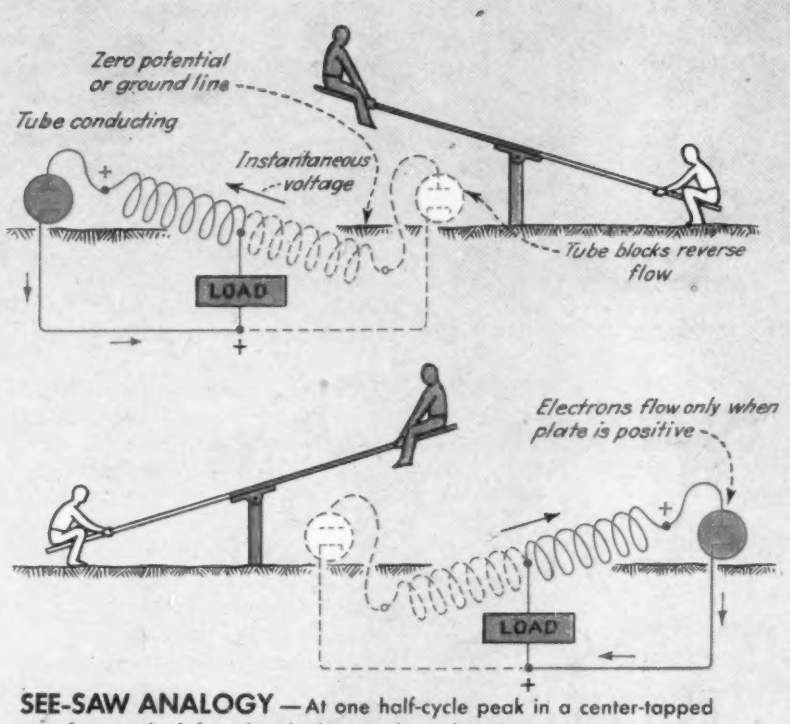
FULL-WAVE RECTIFIERS



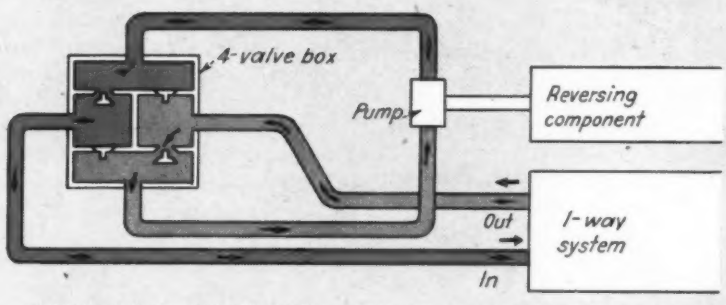
Two "valves" and a 2:1 step-up, center-tapped transformer rectify the ac. line



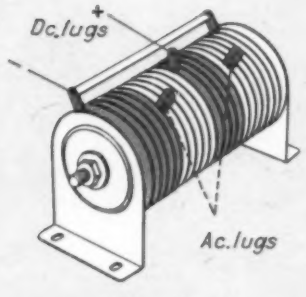
The same result is accomplished with four "valves" without the transformer



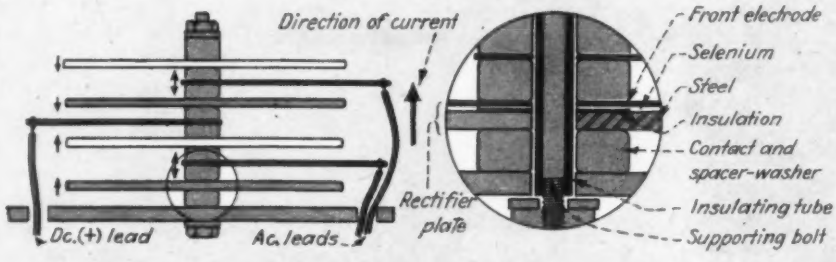
SEE-SAW ANALOGY — At one half-cycle peak in a center-tapped transformer, the left end is "high" (or plus). If each end is connected to a "valve," the current will flow out at the "high" end, through the valve and load and back in at the center. The other valve will prevent any reverse flow in the unused branch of the winding



HYDRAULIC ANALOGY — Reversible machinery that drives its own lube oil pump requires a 4-valve box to maintain the direction of oil flow for lubrication even though the pump is running backwards



This single-bridge selenium rectifier has four arms of five series plates each, so its capacity is 75 volts



SELENIUM RECTIFIER CONSTRUCTION

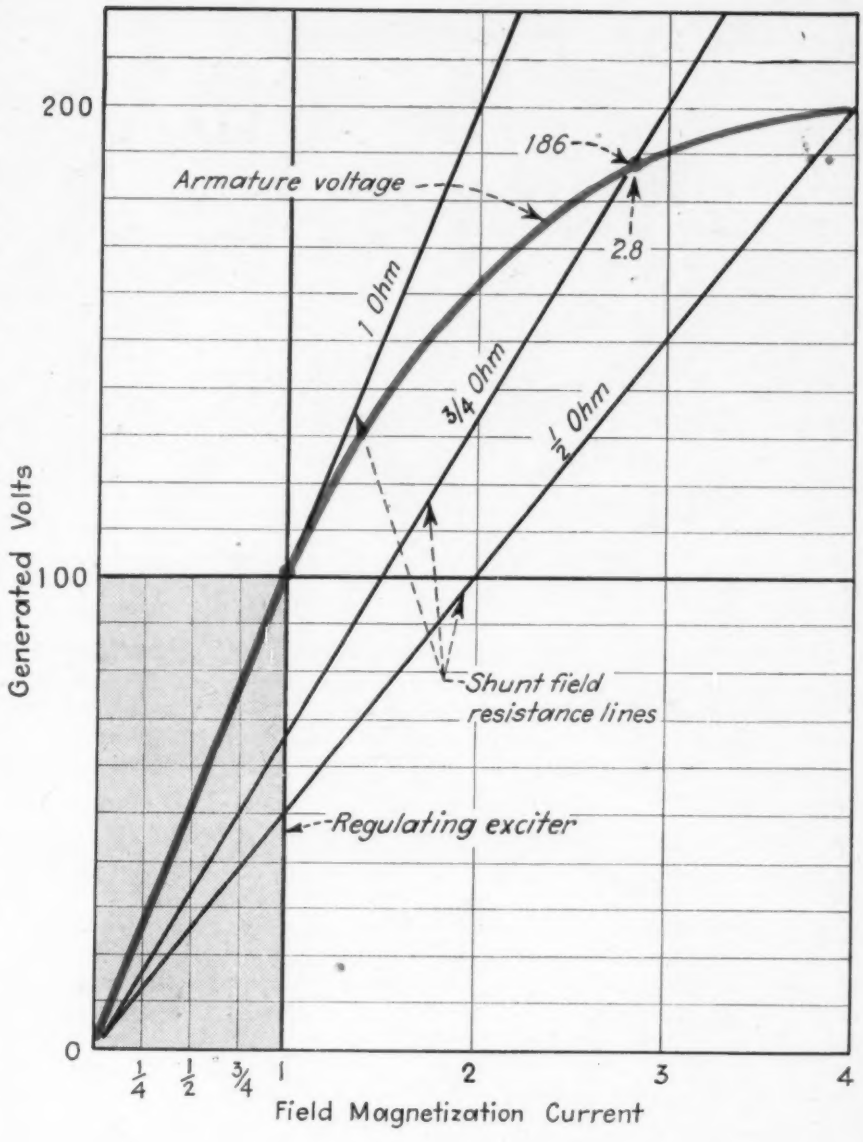
A selenium plate has low resistance in one direction but very high in the other. Current flows from the back of the plate, through the coating and out at the contact area on top. Efficiency is about 75%

magnetic field in the air immediately around it. (Hook-on ammeters work on this principle.) The air doesn't offer any encouragement to this magnetic field, but if the conductor is shaped into a coil and some iron is placed inside, the coil will try to magnetize the iron; although the resistance doesn't change a bit, there will be a drag on the current just the same.

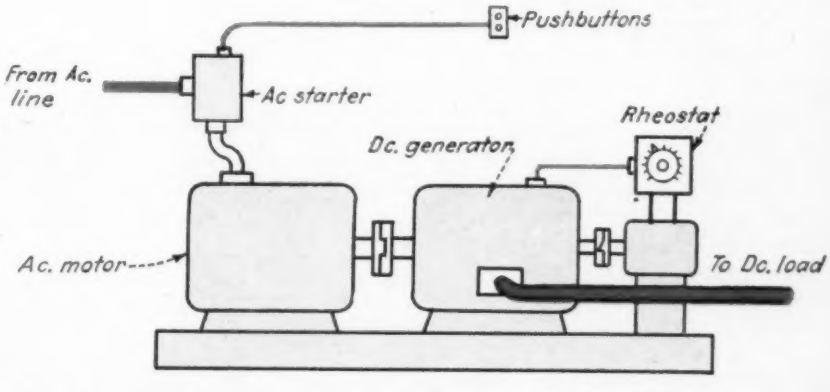
The reactor may be made variable by making the iron adjustable; moving the iron in and out of the coil will vary the effect on the current. But the commoner way is to magnetize the iron from an outside source. When the iron is fully magnetized, the coil will have no work to do and the reactance will be low. When the magnetism in the iron is reduced, the coil tries to make up the difference. A device like this is called a saturable reactor; its use in speed control is the regulation of grid-controlled thyratron and ignitron tubes. The outside magnetizing current comes from a small dc. rectifier, regulated by the rheostat or potentiometer in the pushbutton control station.

Rectifiers — Rectifiers can be subdivided into dry-disk and electronic types. The former is basically a flat metallic disk from ½ sq. in. to about 50 sq. in. in area, especially coated so current will flow easily in one direction but only very poorly in the other. As ac. is an "oscillating" current, one disk will permit a pulse in one direction, but stop the return pulse (a check valve). Four of these disks (or single check-valves) can be arranged in a "bridge" to deliver both pulses *in the same direction*. The single disk is called a half-wave rectifier, the 4-disk bridge, a full-wave rectifier. A single disk will pass and block only about 15 volts max., regardless of size but its current-capacity varies directly with its area. For anything over 15 v., disks are added in series. Large currents can be handled by using large disks or by paralleling disks.

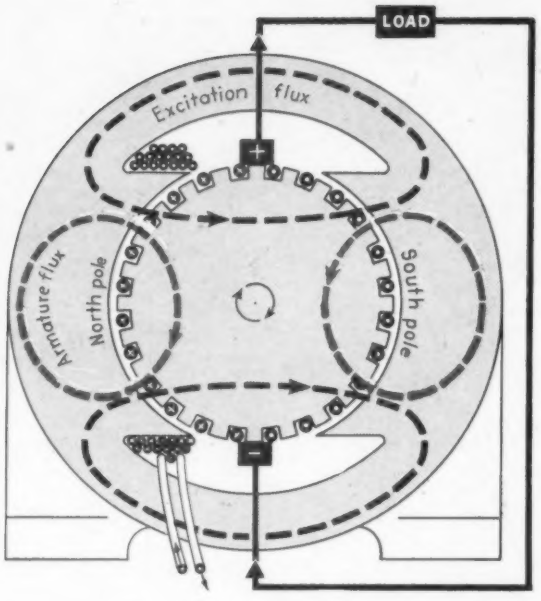
Any radio tube can be used as a rectifier because of the fundamental behavior of electrons. They can flow in only one direction, so when an alternating voltage is placed across the anode (plate) and cathode, the current will flow through only when the anode is the "high" (or plus) side. All radio sets use this principle, both to supply the dc. voltage for the other tubes and to separate the signal from the carrier waves. Special rectifier tubes are now being made to handle very



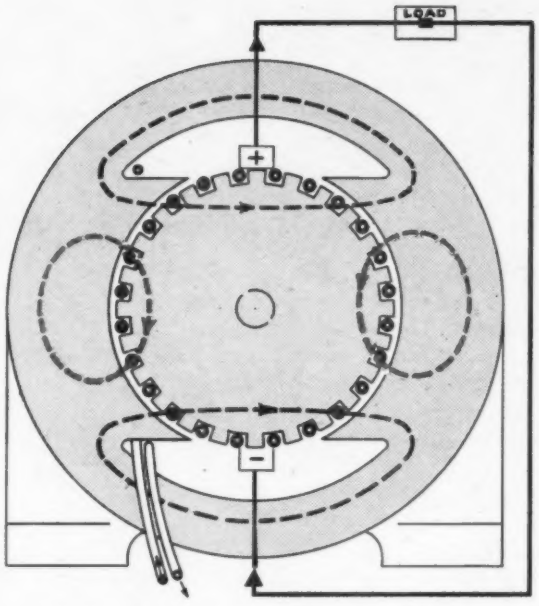
MAGNETIC FIELD SATURATION — Comparing a conventional shunt generator which supplies its own magnetizing power (self-excitation) to a regulating exciter, the conventional generator or exciter "builds up" until its iron becomes saturated. Adjusting the field rheostat swings the resistance line. The regulator's resistance is preset to match the generator characteristic, making the machine unstable. An outside magnetizing influence controls the output



CONVENTIONAL MOTOR GENERATOR — Once started, the M-G set runs at constant speed and the output voltage is adjusted over a 10:1 range by means of the generator field rheostat



A CONVENTIONAL DC. GENERATOR requires about 100 watts (100 volts, 1 ampere) excitation power to give the necessary excitation flux to generate 10,000 watts (100 volts, 100 amperes) in the armature, but the armature current creates flux, which is wasteful



REDUCING THE EXCITATION to 1 watt (0.1 ampere) also reduces the output to about 100 watts, but now the field excitation is down to a value where small, sensitive control devices can regulate it easily. If we could only restore armature current, and utilize its flux...

THE AMPLIDYNE WORKS LIKE TWO

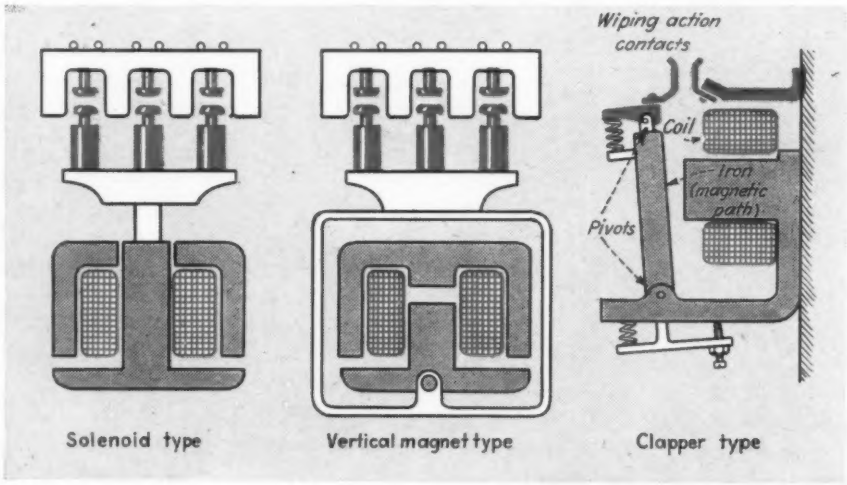
large powers, and some of these have an advantage over the dry rectifier in that the output voltage can be continuously varied. In effect, then, these thyratron and ignitron tubes combine the functions of a converter and a rheostat with maximum efficiency.

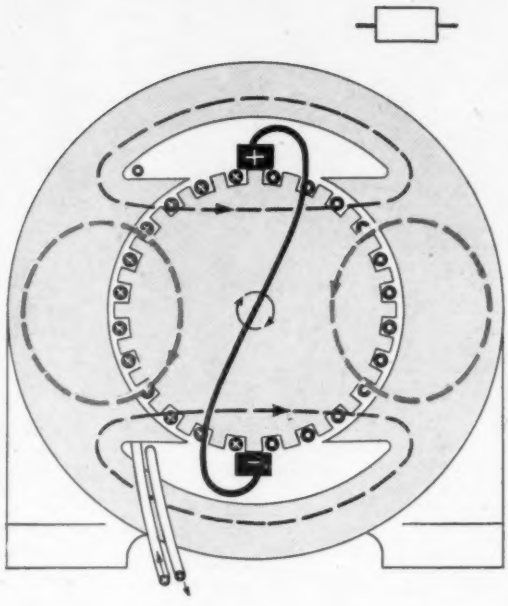
The number of "check-valves," whether dry-disk or electron-tube can be reduced from four to two if the transformer is modified by doubling the secondary winding (twice as many turns) and adding a center tap. With the 4-valve bridge (by the way, *valve* is the British name for an electron tube) the transformer secondary conducts current continuously through two valves for half the cycle, and through the other two valves for the other, opposite, half cycle. When the transformer voltage is doubled, only half the winding is used at a time; the center tap, being in the center, is always neutral, so no valves are needed in this side of the circuit.

Motor-Generators—The M-G set is probably the most economical device to get enough adjustable dc. from an ac. power line to drive motors of 25 hp. and up. The motor part of the M-G set will depend on the available power; usually it will be a 3-phase squirrel-cage motor. The generator can be any of several types. After the set is started in the usual way with an ac. linestarter, it continues to run from then on at constant speed. The voltage at the generator terminals is controlled entirely by its field. More field current means more magnetic flux and that means more voltage until the iron is fully magnetized. The shunt generator has two limits to its voltage range. The minimum voltage is limited by the residual or remaining magnetism when there is no magnetizing current and the maximum voltage is reached when the generator field is fully saturated.

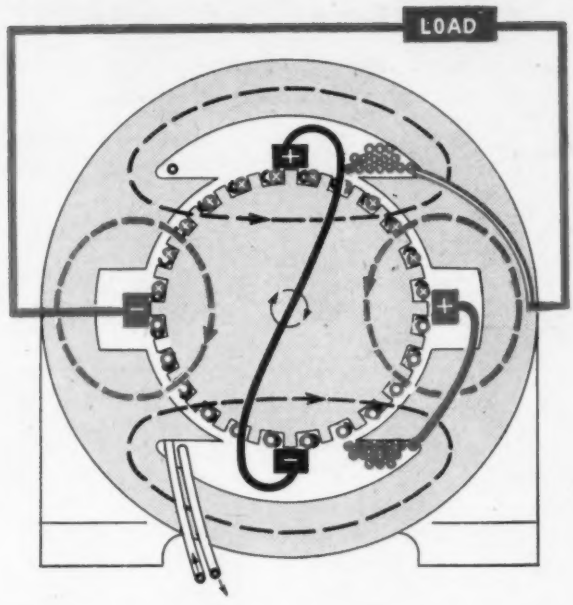
The Rotating-Regulating-Amplifying-Exciter—If you make a small self-excited shunt generator with so much iron in its field structure that it can never become saturated by its own output, and then adjust and permanently fix the resistance of the

VERTICAL ACTION CONTACTORS have straight-line sliding motion—no pivots—and horizontal contacts. Clapper-type contacts are vertical. Swinging motion combined with the contact spring provides a self-wiping contact





A SHORT CIRCUIT across the brushes substituted for the load restores full armature current and full armature flux because the short circuit has 1/100 the resistance of the original load, and it takes only 1/000 the voltage to cause the full current to flow in the armature circuit



TWO MORE BRUSHES "tap" the armature flux and produce full 10,000 watts power, now with only 1 watt excitation power. A compensating, series field in the load circuit offsets the tendency to create another wasteful flux caused by the new, additional armature current.

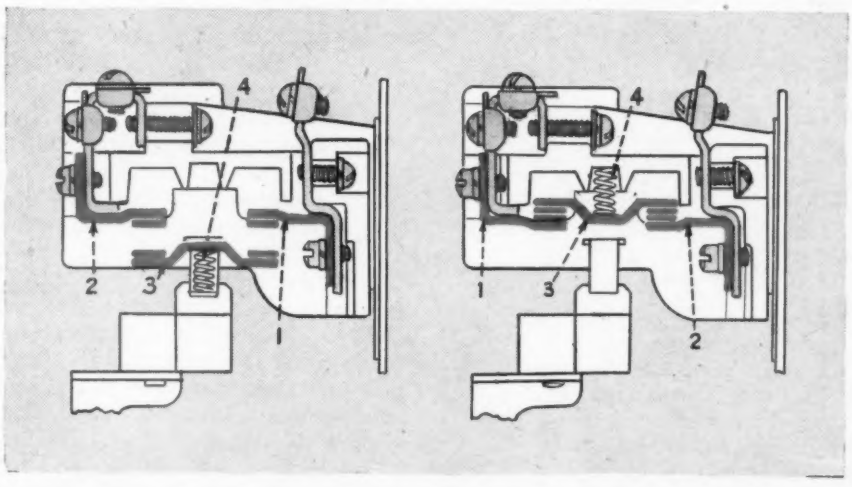
GENERATORS COMBINED INTO ONE

field circuit so the voltage generated always just exactly balances the magnetism it creates, the generator becomes unstable and very sensitive. Now, a very small supplementary field coil will enable a very small current to "throw" the whole generator in either direction very quickly by adding or subtracting just a little to the field strength.

Another amplifying exciter behaves like two generators combined into one. The small variable signal current from the machine element excites one field in the "Amplidyne." This regulates its armature current (which may be up to 100 times as great), and this current creates *another* field in the same iron which will permit another pair of brushes to take off 100 times again as much current. A typical Amplidyne operates with a signal varying from 1 to 4 watts, giving an output of from 10,000 watts to 40,000 watts (10 to 40 kw.) with almost no time delay.

On metalworking tools, these devices are used to reverse large motors quickly, to buck residual fields and thus drive motors at creeping speed, and to position a table or workhead to an accurate stop. Precision, sensitivity, quick response, and simplification are its features.

REVERSIBLE CONTACTS, built into many relays, allow a standard unit to be converted from normally open to normally closed in less than one minute. The four contact members are merely removed and reassembled



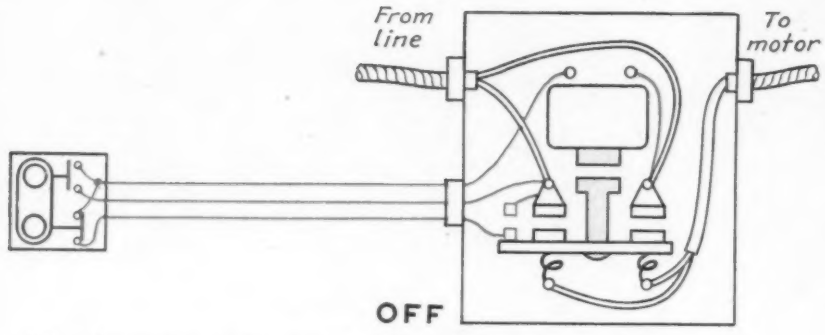
Starters

The simplest device to start a motor is a knife switch. But before one can be installed with assurance, several questions must be answered in the affirmative: Can the operator be protected? Can the motor and its load withstand the stress created by heavy inrush current? Can the power line absorb the short overload without damage? Can the switch be mounted where it will be convenient to the operator? On motors under ¼ hp., these answers are often "yes," although the switch actually selected is usually the snap-toggle rather than the plain knife switch.

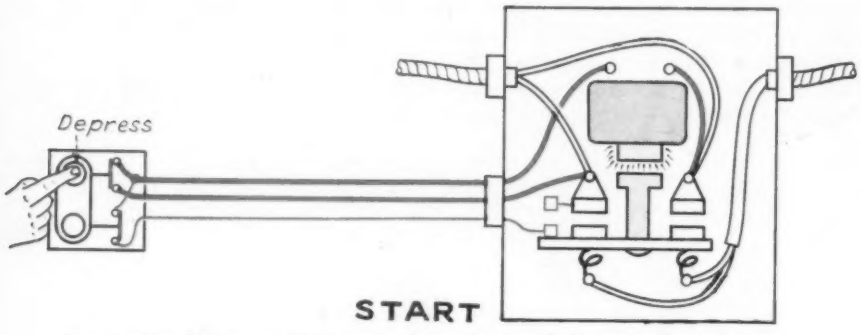
Manual Starters—If the answer to any of the above is "no," a manual or magnetic starter must be used. A manual starter solves the overload problem by means of a large rheo-

SCHEMATIC CONTACTOR

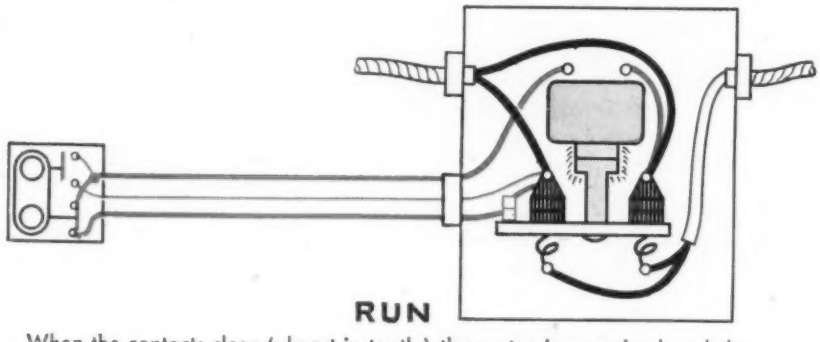
assumes control voltage same as power line; coil and pushbuttons are connected to the line



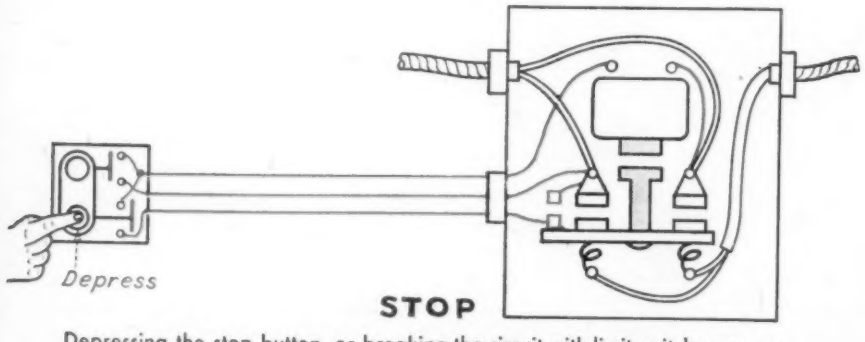
When the main contacts are open and the buttons are at rest, the "stop" circuit is closed, but "start" button and holding contacts are open



Depressing the "start" button completes the circuit to the coil, creating a magnetic force which attracts the moving member and picks up the contacts



When the contacts close (almost instantly) the motor is energized and the holding contacts replace the start button which can then be released



Depressing the stop button, or breaking the circuit with limit switches or protective devices, will open the coil circuit and all contacts will drop

stat. The hand-operated sliding arm limits the starting voltage and current and allows the motor to accelerate slowly as the resistance is cut out smoothly. Manual autotransformer starters are also used frequently for induction motors; the motor is first connected to a low voltage tap on the autotransformer, then to a higher voltage tap and finally connected across the line. Manual starters are bulky and can hardly be said to meet the convenience requirement except where the motor is started and stopped at infrequent intervals.

Magnetic Starters—Magnetic starters are *the* starters because of their extreme application flexibility. They can be assembled to meet almost any set of requirements for individual motor starting, accelerating, braking and reversing, and because they are electrically operated, they can be easily synchronized to operate properly in some automatic cycle, controlled by any one or combination of several pilot devices.

Across-the-line magnetic starters are commonest. Practically any ac. motor can safely be started at full voltage, and it is usually cheaper to put the necessary reserve capacity in the power lines than to install reduced-voltage starters. Dc. motors over ¼ hp. have to be started at low voltage, but dc. power distribution for general-purpose use is rather rare these days. (The steadily increasing popularity of dc. motors is based on comparatively new or much-improved ways to generate and control dc. locally.) It follows, then, that dc. magnetic starters are less used now than formerly.

Components of a magnetic starter are the contacts and the electromagnet. Two principal designs are in use.

One has its fixed contacts—flat surfaces of copper or special alloy plate—in a vertical plane. The mating contacts travel in a short arc (they are hinged on a horizontal shaft) as the magnetized iron core of the coil draws the arm inward. This is described as a clapper-type starter.

The other is the solenoid type. Here, the fixed contacts are in the horizontal plane facing down and the moving member is a vertical plunger which slides through the center of the coil and carries the mating contacts up into closed position. Both types have certain advantages, but as neither has completely replaced the other, it can only be said that each has an application

where its choice is preferable.

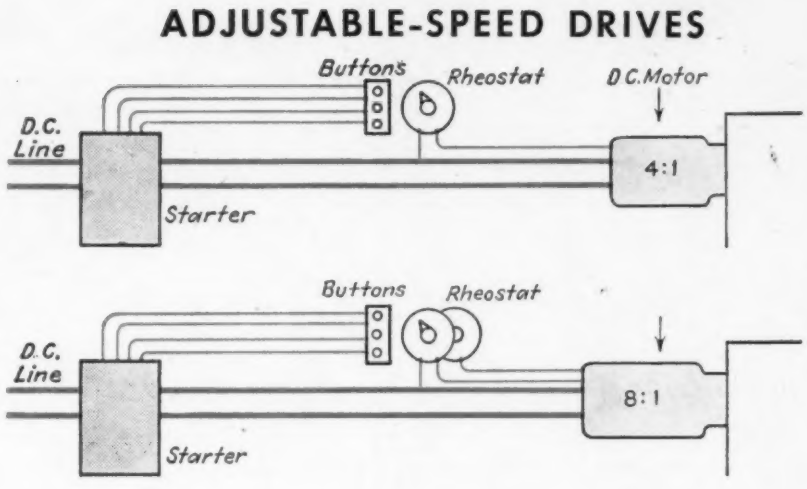
Combination Starters—The starter proper is a contactor (magnet and contacts) plus suitable overload relays. The term "starter" is often used to include several starters or contactors and various relays and protective devices when they are all mounted in one enclosure separate from other control devices, and used for the purpose of starting, accelerating, braking, and reversing one motor. A "combination starter" combines the starter proper with a disconnect switch and fuses or a circuit breaker and is often used for a single-motor machine tools, like lathes.

Start and stop buttons are mounted on the machine conveninent to the operator; the combination starter can be mounted anywhere close by, on the nearest wall for example. The disconnect switch is used only occasionally—to turn the power on and off each day, to lock and protect the machine against unauthorized or accidental operation, and to shut off all power when the machine or the control equipment is being overhauled.

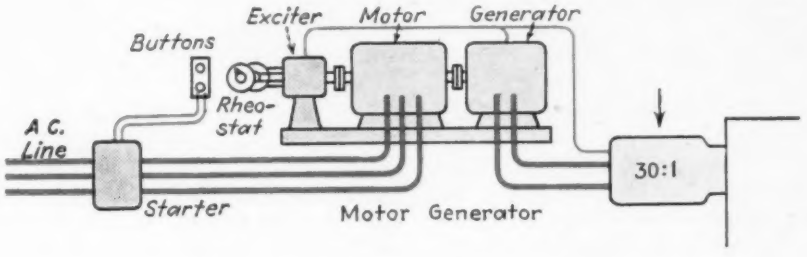
Adjustable-Speed Drives

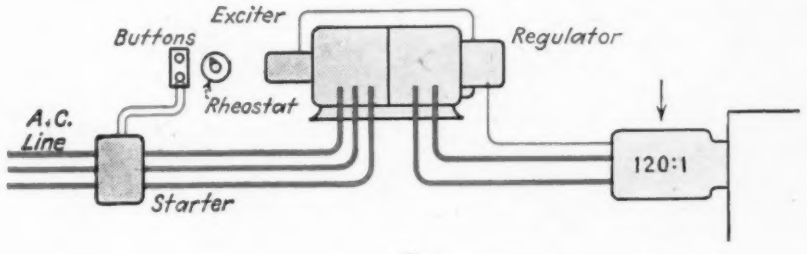
The choice of drive for a metalworking machine depends on many factors. Some of the more important are: the power desired, the speed range, either number of separate speeds, or the continuously adjustable speed range; the load characteristic; the available power source; the degree of automatic operation desired. There are many more, of course, such as the cost, for one, but it will usually be found that the more expensive drive will pay for itself in increased output, and, in any case, the increase in cost over the simplest or cheapest drive will seldom exceed 5% of the cost of the machine.

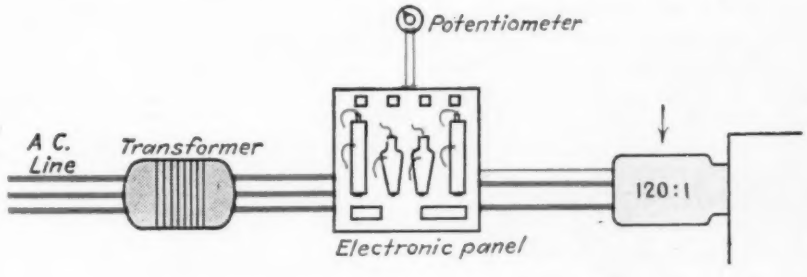
Continuously adjustable-speed motors from 1 to 40 hp., with a range of 120:1 are now in successful operation on machines of many types. Sometimes, this extreme flexibility is really valuable in the time it saves over gear-shifting, especially when the process is automatic. But before analyzing the features of these systems, it may be said that there is still room, and even many advantages, for a more conservative speed-range adjustability and one or two gear changes, just as there is still



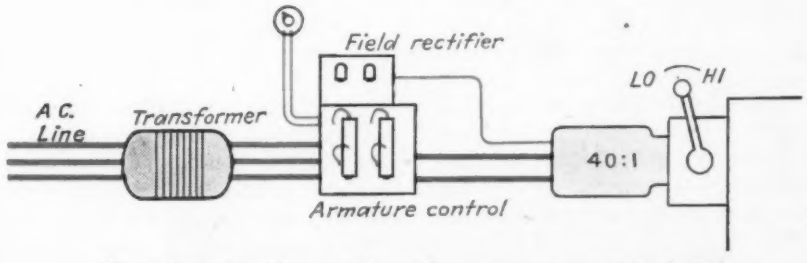
Constant-voltage dc. permits about 4:1 speed range by field control with standard shunt motors. Newer designs will extend to 8:1



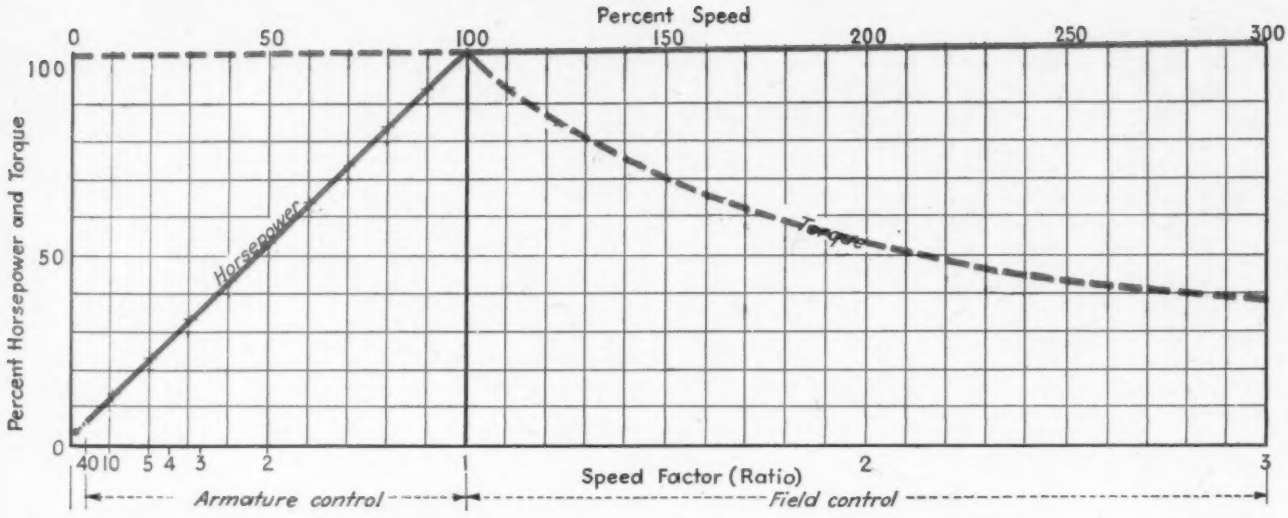




Adjusting armature voltage extends the range. Conventional motor-generators require a regulator for wide range and quick reversing, but electronic control does the same thing with no moving parts



Many electronic drives now in use have armature control only. This, combined with one quick gear change, may provide the best solution



DC. SHUNT MOTOR SPEED CHARACTERISTIC
With full voltage and full field motor runs at base speed. Reduce the *field current* and the motor speeds up. Reduce *armature voltage* and motor slows down. Upper speed limit is the motor's ability to withstand centrifugal force. Lower speed limit depends on the safe overheating due to reduced ventilation. Both depend on the voltage and current control that is available for regulating

room for hydraulic drives on many applications.

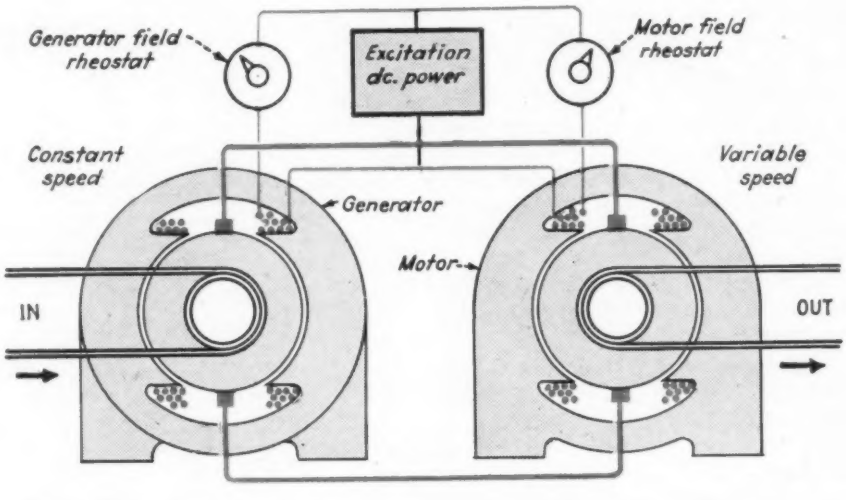
Consider first the power requirements and the load characteristic from the lowest to the highest speed. Assume you're powering a lathe or a boring mill. Here, hp. required is fairly constant at all speeds, and the spindle doesn't reverse often; also, when cutting, the speed remains constant. The power may be from 1 to 40 hp.

Now, think of the requirements for a planer. Regardless of cutting speed, it is always desirable to have the highest return speed possible to reduce dead time. The motor must reverse many times a minute and always accelerate as quickly as possible in both directions. These are about the same conditions as are found on a small scale on an automatic tapping machine.

On the lathe or boring mill, it's good to have as many speeds as possible, but there is never the necessity to jump quickly from slow to high speed, or to reverse quickly. Here, the wide speed range may be obtained easily by employing one gear change at no sacrifice in convenience. On the rapid-reversing drive, where very high speed in reverse is required, changing gears would lose time.

The DC Motor—Now, let's look at the load characteristic of all adjustable speed drives. As most of them use a dc. shunt motor to furnish the mechanical power, the drive can be no better than this motor. The rating of a shunt motor in hp. and rpm. is the power it will develop when there is full rated voltage at the brushes and all the field resistance is out (full field current). This is its base speed. Now, cutting resistance into the field will lessen the magnetizing current and weaken the field and the motor will go faster to compensate. Most dc. motors can safely go up to four times as fast as base speed by field weakening. (Newer, special designs will go eight times as fast.) Over this entire range the hp. will be constant. Horsepower is proportional to torque times speed. Here, the torque will decrease due to the weakened field, but as torque diminshes, speed increases so the effect is equalized. As long as there is full voltage at the armature, then, you get full horsepower regardless of field strength and speed. Now, with full field, hence full torque, if you reduce the armature voltage, you reduce speed and hp. output proportionally. So, at 1/10th base speed, the motor will only deliver 1/10th its rated hp. (but the torque is still at its full value).

In a shunt motor, the field cur-



GENERATOR-MOTOR—Mechanical power turns the generator armature at constant speed; its voltage and power output depends on the magnetizing current it receives from the excitation source through its field rheostat. The generator brushes and motor brushes are tied in a solid loop. With the motor field rheostat stationary, increasing the generator field increases the two armature voltages and the motor speed and power increase and torque remains constant. Adjusting the motor field rheostat, with the generator rheostat stationary, increases speed with a decreasing torque at constant power by weakening the motor field (compare a hydraulic pump and motor)

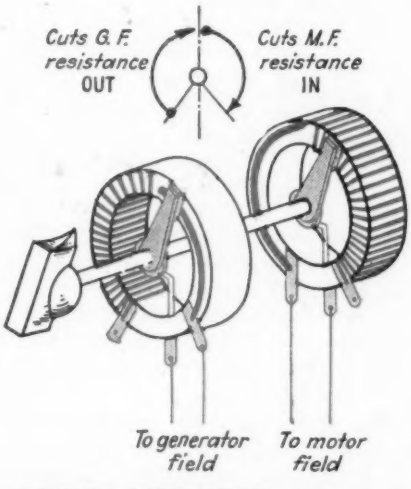
rent is only a small percentage of the armature current, so is relatively easy to adjust with a rheostat with little loss. But an attempt to regulate a shunt motor for any length of time below base speed by using a rheostat in the armature circuit would be very wasteful and the speed would vary greatly as the load on the motor changed—i.e. it would have poor speed regulation.

When a 4:1 speed range is adequate, or when the wider range can be made up by adding a gear change, a constant-voltage dc. source will do the job. When the wider adjustment is desired, it means that an adjustable dc. source in the form of a motor-generator or electronic tube is required.

Ward Leonard System—The simplest wide-range adjustable-speed drive is the Ward-Leonard type, and it will provide adjustability over a range up to 30:1 (partly by motor field control and partly by generator field or motor armature control). Separate excitation is used, and the exicter is driven on the same shaft with the generator, or a dry rectifier is used. There will be two rheostats: one controls the motor below base speed when the motor has full field; the other controls the higher speeds when the motor has full armature voltage. These rheostats are sometimes "ganged" together for operation with a single knob.

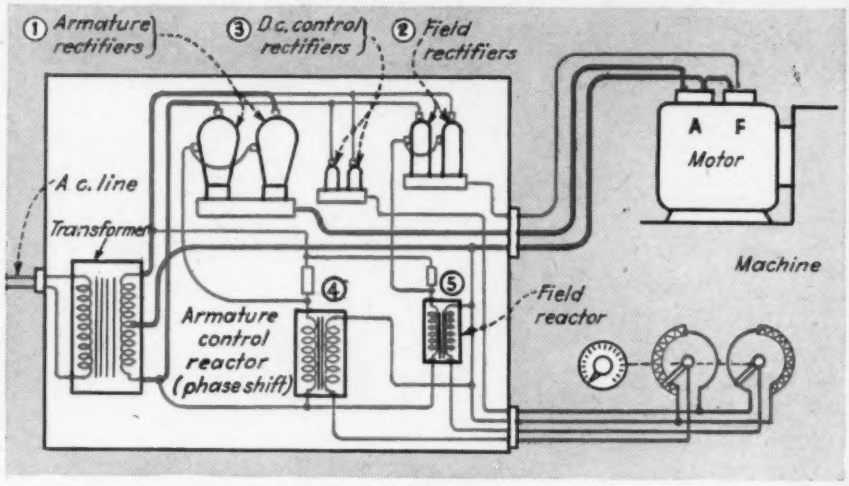
This system does not lend itself readily to quick reversals or automatic operation and it has only moderate provision for maintaining constant speed under varying load.

For a lathe or boring mill these



DOUBLE RHEOSTAT As the two rheostats operate alternately, each can be compressed into half the dial rotation so one shaft now can move both, but with independent functions

ELECTRONIC SPEED CONTROL PANEL



ADJUSTABLE VOLTAGE to the motor armature is supplied by two grid-controlled thyratrons and two more, smaller thyratrons supply the field. Saturable reactors advance and retard the "firing angle" regulating the tube output. As in motor-generator control, there are two rheostats. Here, they adjust saturation in the two saturable reactors providing phase shift

are not drawbacks. A drive like this could, for example, provide an infinite number of speeds from 1800 to 600 at constant hp. and then maintain constant torque down to 90, with the "back gears" out. Shifting into "low" (4:1 reduction) would make full speed 450 rpm. and the low range would extend down to 112 at constant hp. and constant torque down to 22 rpm., for an overall range of 80:1, and the torque in the low range is four times that in the high.

Regulated Motor-generator Drives—Addition of a rotary-regulating-amplifying-exciter to the basic motor-generator drive can do at least four things:

1. It will extend the speed range to as high as 120:1.
2. It will act as governor to maintain nearly constant speed under all loads, or if desired, to adjust the speed closely to keep the load constant.
3. It will start, stop, reverse and accelerate motors, overcoming with great speed the mechanical inertia of heavy rotating or reciprocating parts.
4. It will position heavy machine components in motion or at rest with fine precision.

All these functions are the result of its responsiveness to a small signal and its 10,000:1 amplification of that signal, with about 4:1 adjustment range.

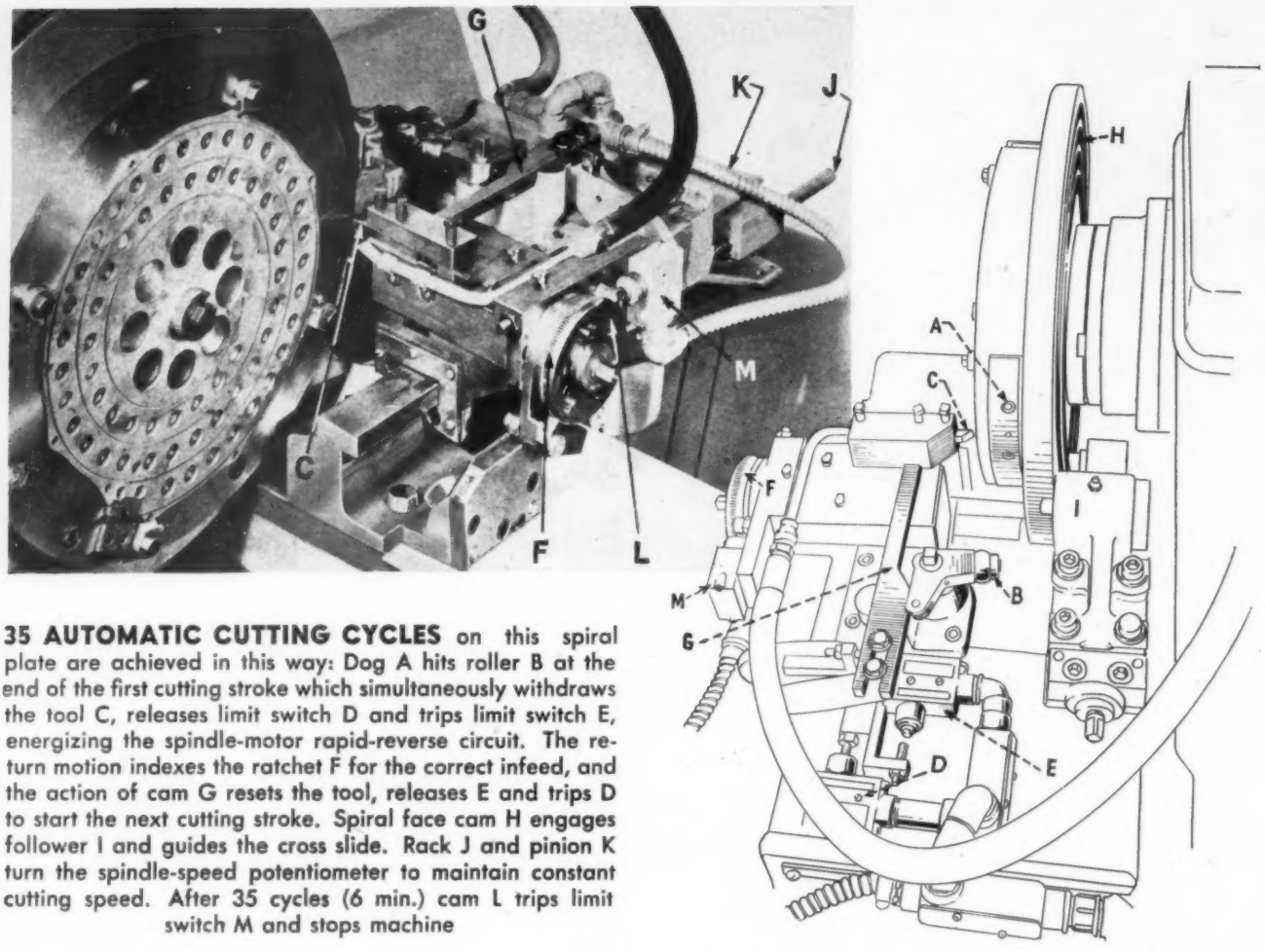
One leading application in metalworking is on drives for planers.

Electronic Speed Control—A 5-hp. motor-generator set is bulky and it just about triples the maintenance problem when two rotating machines are needed to control the one tool motor. It is around this hp. that electronics is coming in strongly. First cost may be a trifle higher but it can do all that an M-G set can do and more, and do it silently, within a compact little box. Industrial electronic equipment is easy to maintain, although it requires a little special training.

It was shown how two valves could rectify both half-cycles of an alternating current using a center-tapped transformer. Here, the load is the motor field, for one pair of thyratron tubes and the armature for the other pair. These thyratrons have grids which act as throttles. Without the grid, the tubes would run "wide open," conducting as much current, continuously, as the motor demanded. With the grids, the electrons won't begin to flow each half-cycle until they get the "green light."

As explained previously, electrons and current can flow only when the plate is positive. If the grid is negative, even though the plate is positive, the grid becomes a barrier and nothing will happen. As soon as the grid goes positive (while the plate is still positive) current will start to flow and continue to flow no matter what the grid does, until the plate becomes negative and the other tube takes over.

Grid control can be effected with a saturable reactor. When the re-



35 AUTOMATIC CUTTING CYCLES on this spiral plate are achieved in this way: Dog A hits roller B at the end of the first cutting stroke which simultaneously withdraws the tool C, releases limit switch D and trips limit switch E, energizing the spindle-motor rapid-reverse circuit. The return motion indexes the ratchet F for the correct infeed, and the action of cam G resets the tool, releases E and trips D to start the next cutting stroke. Spiral face cam H engages follower I and guides the cross slide. Rack J and pinion K turn the spindle-speed potentiometer to maintain constant cutting speed. After 35 cycles (6 min.) cam L trips limit switch M and stops machine

actor is fully saturated, the ac. coil is unaffected and the voltage applied to the grid will match the voltage at the plate so the tube will conduct for the full half-cycle. As the magnetism is reduced, the ac. will begin to lag and won't become positive each cycle quite as soon as the plate voltage. This reactor is designed so it can keep "retarding" the grid (just like the spark control in a gasoline engine) until the tube won't conduct at all. When the intermittent pulsating outputs of these tubes are filtered so they are fairly smooth, the final result will be an adjustable dc. voltage.

Adjustable-speed Drives Summarized—1. They all use a dc. motor (usually a shunt motor—series motors are used occasionally and wound-rotor ac. induction motors rarely).

2. For a speed range of 4:1, and possibly up to 8:1, a constant-voltage dc. motor is adequate if dc. power is available.

3. Beyond this, there must be a way of regulating heavy dc. power for economical operation for long periods of time.

4. Dc. motors are all much the same. The whole choice resolves itself into what kind of dc. power source to use and how it will be controlled. Here are the choices and their features:

(a) Large motor-generator to supply the whole plant.
   1. Relatively low cost and high efficiency; low maintenance.
   2. Suitable for 4:1 to 8:1 drives. (How about using one gear change?)

(b) Large dry rectifier.
   1. High first cost, relatively low efficiency (75%), very low maintenance.
   2. Same as above.

(c) Conventional coupled motor-generator loop (Ward-Leonard type)
   1. Speed range around 20:1 up to any hp.
   2. For the flexibility it offers, it's the cheapest and simplest drive and is easy to maintain.

(d) Motor-generator with rotating-regulating-amplifying-exciter
   1. Permits automatically regulated speed control at any hp. over 120:1 range.
   2. Expensive but low maintenance.
   3. Takes only a little more space than (c).

(e) Electronic rectifier control
   1. 120:1 speed range—reasonably priced around 5 hp.; comparatively more expensive at 25 hp.
   2. Only maintenance is tube replacement.
   3. It is compact, quick-acting and noiseless.

For wide-range drives over 25 hp., the regulated M-G set is probably best. For drives between 1 and 5 hp., electronics has the best answer. Between 5 and 25 hp., they are near enough each other to be competitive, and individual application requirements will determine which to use.

Automatic Controls

Automatic electric controls, for the most part, are the coordination and synchronization of standard con-

trol elements used to operate the machine manually, plus relays of various kinds to take over and perform the work of pushbuttons in the proper sequence after various selector switches have been set.

Perhaps the most important, and certainly the first, duty of automatic control is protection. Nearly all production machines nowadays are pressure-lubricated, and a lubrication failure would be disastrous. The first step in starting a machine, therefore, is starting the lube-oil pump motor. If any attempt is made to start anything else first, nothing will happen because the oil pressure switch will be open, and if oil pressure should fail at any time during normal operation, this switch will open and shut down the entire machine.

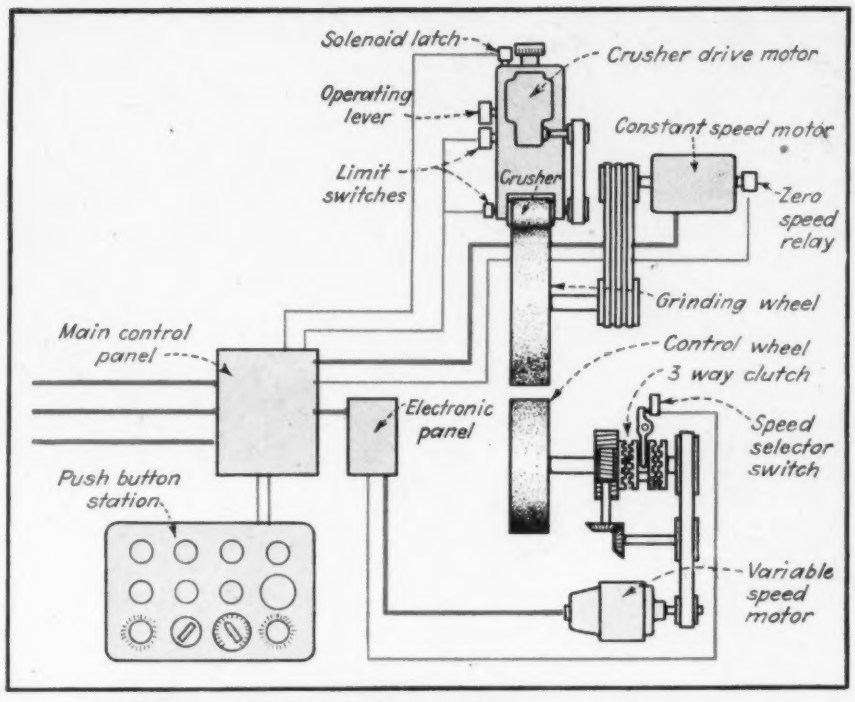
Most motors have overload and undervoltage protection in the form of special relays to open the circuit automatically and stop the motor if something should go wrong during a cut. If the spindle motor should stop for any reason, there must be protection for the feed motor before it has a chance to bring a stationary cutter into the work and cause damage. On many machines it's impossible to start the feed motor before starting the spindle due to an interlocking relay, which also protects the machine against spindle failure.

These are only a few examples of automatic protective devices. Much the same idea is employed to synchronize and direct tool functions as well.

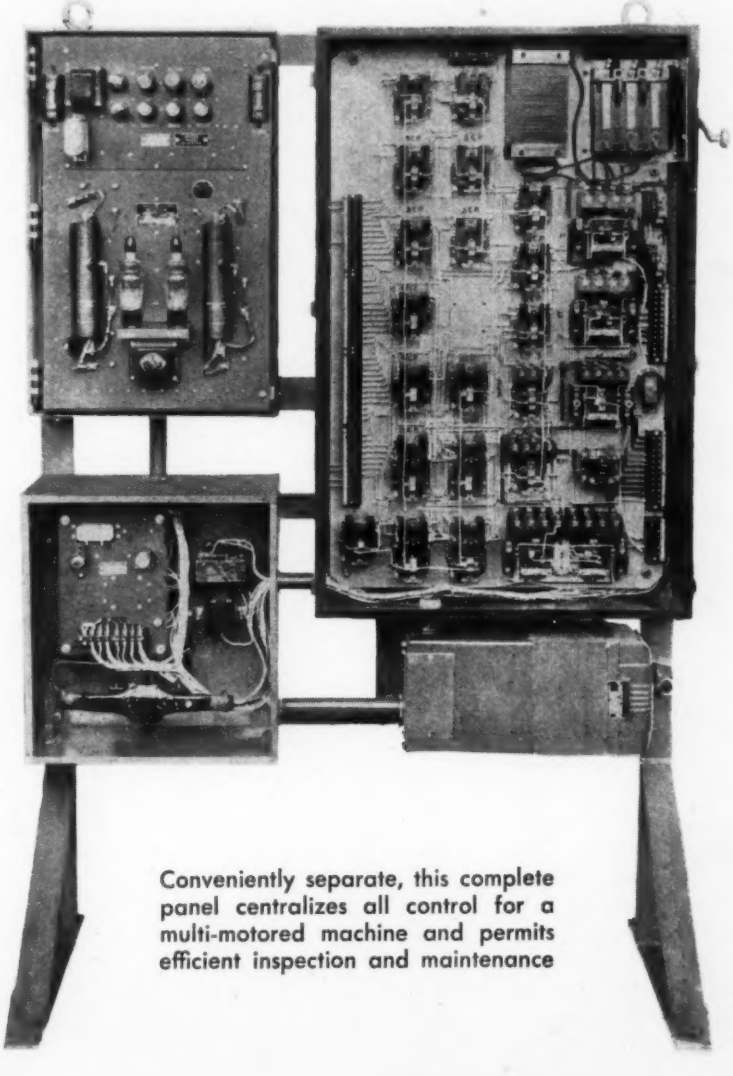
Chucks, vises and clamps are now electrically operated in many machines. Some are powered by electric motors directly; others are electro-hydraulic or electro-pneumatic, controlled by solenoid-operated valves.

With automatic loading, unloading, indexing and positioning, the next step is the control of the cut itself. Sometimes this is done with a templet or master and a tracer unit. The tracer can be a mechanical linkage with a stylus, or a fully electric or electronic device. Some of these tracer units have the power of memory—guiding them through one complete cycle by hand will be sufficient to set the various limit switches and establish the pattern inside the "brain." Then, even if interruptions do occur, the cycle itself won't be destroyed until a new pattern is desired.

The operating principle of one automatic contour-following system can be compared to that of the elec-



CENTERLESS THREAD-GRINDER has electronic, constant-torque control wheel motor with two-speed clutch. Lube oil pump is started automatically before anything else can start



Conveniently separate, this complete panel centralizes all control for a multi-motored machine and permits efficient inspection and maintenance

tric phonograph. The stylus or tracer itself is the "needle"; the templet is the record. The deflection of the stylus as it moves along the templet generates a varying voltage which is electronically amplified and sent to the power tubes controlling the feed motor. But there has to be one more step: the tracing unit must know whether its signals are causing the proper effect so the tool feed motor returns the signal, usually by moving the whole tracer head just as it moves the cutter. The cutter and tracer may be mechanically integral or connected. But if necessary, they may be entirely separate and synchronized electrically.

Machines which have adjustable-speed spindles can be made responsive to the cut to maintain any given requirement. When the work diameter is variable, the spindle speed will automatically adjust to maintain constant surface feed, or, should the material have hard spots, the spindle will also adjust to maintain constant torque.

Machining the spiraled end-plate of a 20 mm. machine gun magazine illustrates the integration of several phases of electric control into a fully-automatic machine: 1. The spindle is powered by an electronically-controlled adjustable speed motor, regulated by the tool cross slide to maintain constant surface speed as the tool advances across the face of the work. 2. Rapid spindle reversal at the end of the cut and return strokes is accomplished with limit switches, and a separate potentiometer sets the electronic control for best return speed. 3. The rest of the control is mechanical. A ratchet supplies the in-feed for every cut and a cam on the ratchet trips another limit switch to stop the machine after 35 cuts. The two spindle-reversing limit switches are operated by the same mechanism that retracts the tool for each return stroke, and the cross slide is driven directly by a face cam on the rear of the faceplate itself. With a vertical miller and a highly skilled toolmaker, production was 1.5 parts an hour. The automatic setup produces 10 pieces an hour. Another comparison: The electronic motor control costs 10% more than a 3 to 1, two-speed drive, which was tried, but production favored the electronic spindle drive by 48%.

Wiring and Standardization

Last here, but first in importance, is the installation of control equipment. The electrical manufacturers, the machine-tool builders, and the users, headed by the automotive industry, have cooperated in making controls so they are easier to install and maintain, mostly through standardization.

The electrical manufacturers are building controls that are interchangeable, not only electrically (according to NEMA rating), but mechanically as well. This means that tool builders have the option of selecting any make of control or leaving that choice to the customer without changing the control enclosure at all. Or, they can and do assemble their own control from standard parts.

The tool builders contribute by making the control enclosure and the wiring accessible for inspection and maintenance. Some machines have the control enclosure cast integral with the machine in such a way that it's neither built-in nor attached. It was decided that "hidden" controls and excessive streamlining were bad from the maintenance standpoint. The best compromise seems to be an enclosure that is somewhat recessed yet really external to the machine. A cast-iron or aluminum door with heavy hinges and a rubber gasket makes the unit water and moisture, dust and oil tight, and resistant to accidental blows.

Wiring within the enclosure is always neat and easy to trace and terminal strips make connections and replacements easy. Outside the enclosure, wiring is now in conduits or raceways that are accessible for inspection.

It may seem that these "improvements" just waste valuable space and clutter up the machine and add to the expense. In large plants where high-speed production is absolutely essential to success, machines are so closely integrated and inter-dependent that a small breakdown anywhere may bottleneck a whole shop.

These people can't stop and call any service representative or send to the factory for replacements. They have to have the spare parts *right there* and be able to restore the normal operation in a matter of *minutes* (not hours or days). Machines operate at full capacity continuously for days—it's not like a toolroom where a lathe or grinder is used intermittently.

This speed of repair depends on two factors: (1) accessibility and (2) availability. They have to have motors and controls that are all exactly alike, even though they may be a little larger or clumsier than necessary, or else they would have a tremendous problem in stocking individual replacements for every single machine.

One comparatively recent idea that is rapidly gaining favor is the "wireless" wiring diagram. This development is comparable to the substitution of perspective cutaway or exploded assembly drawings for the old orthographic 3-view blueprints.

In this system, every terminal of every electrical device has a code number. Lines representing wires are unnecessary; instead, there is a table of the code numbers showing clearly where each connection is to be made, and you don't have to be an electrical engineer to decipher it.

We Gratefully Acknowledge. . . . .

American Machinist expresses thanks to these companies and organizations for cooperation in supplying information and suggestions

Allen-Bradley Company
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W. F. and John Barnes Company
Brown & Sharpe Manufacturing Company
The Bullard Company
Bryant Chucking Grinder Company
The Cincinnati Milling Machine Company
The Cincinnati Planer Company
The Clark Controller Company
Cutler-Hammer Inc.
Ex-Cell-O Corporation
Federal Telephone and Radio Corporation
General Electric Company
General Motors Corporation
Giddings & Lewis Machine Tool Co.
Landis Machine Company
The R. K. LeBlond Machine Tool Co.
Mattison Machine Works
The Monarch Machine Tool Company
National Automatic Tool Company Inc.
National Machine Tool Builders' Association
Ohmite Manufacturing Company
Raytheon Manufacturing Company
Reed-Prentice Corporation
Square D Company
Sundstrand Machine Tool Company
Warner & Swasey Company
Westinghouse Electric Corporation

ROUND TABLE

Wheedler or Needler?

"Relax, Bill! You're beginning to get under the boys' skins. They're going along pretty well, considering that they can't get foods, clothes or houses they want, can't understand either American or foreign politics, and are generally more upset than usual. It's always like that after a war."

Ed came walking up, just as Al delivered this parting shot at the expediter. "Why shouldn't he get under the boys' skins, Al? That's his job—he's a work pusher—what they call a coordinator in Washington. His big job—and pretty near his only one—is to give the guys the needle."

"You think the only way to smooth out slow spots and to keep the production curve up is to needle people. Well, it isn't. The jabbing thumb and pointing finger might do some good if you're sure a guy is soldiering, but they only get shop men mad if the real cause is something else. Even an expediter ought to be reasonable."

"Maybe he ought to be a wheedler instead of a needler, to suit you, Al. Then you'd be satisfied and all would be calm and collected out here. But the front office might as well save its dough and fire the expediter. To work that wheedle routine, a guy has to be a football coach or a snake charmer—like that fella that blew a flute and got the rats to follow him."

"You make it sound like anybody who can get people to work without a club is a snake charmer, Ed. There only was one Pied Piper—and he got so mad over not getting paid that he piped all the local kids away too, if you remember. I'm just arguing that an expediter can get better cooperation if he doesn't start throwing his weight around."

"The sweetness-and-light boy again, aren't you, Al? You should be a Sunday School teacher or an editorial writer. You know that you've got to put your weight into any job to push it along. This ain't no football game, with the boys going into a huddle to do or die for dear old Podunk. Their main object is to get their dough with as little hard work as possible."

"Sometimes I think you're getting old, Ed. You think back and you'll remember that any job is more fun and goes faster if everybody feels good. If some guy is there with the needle all the time, it gets to be irritating and you hold back to get even. The expediter's job is to get the guys to work with him on the parts that are behind, not to turn on the heat."

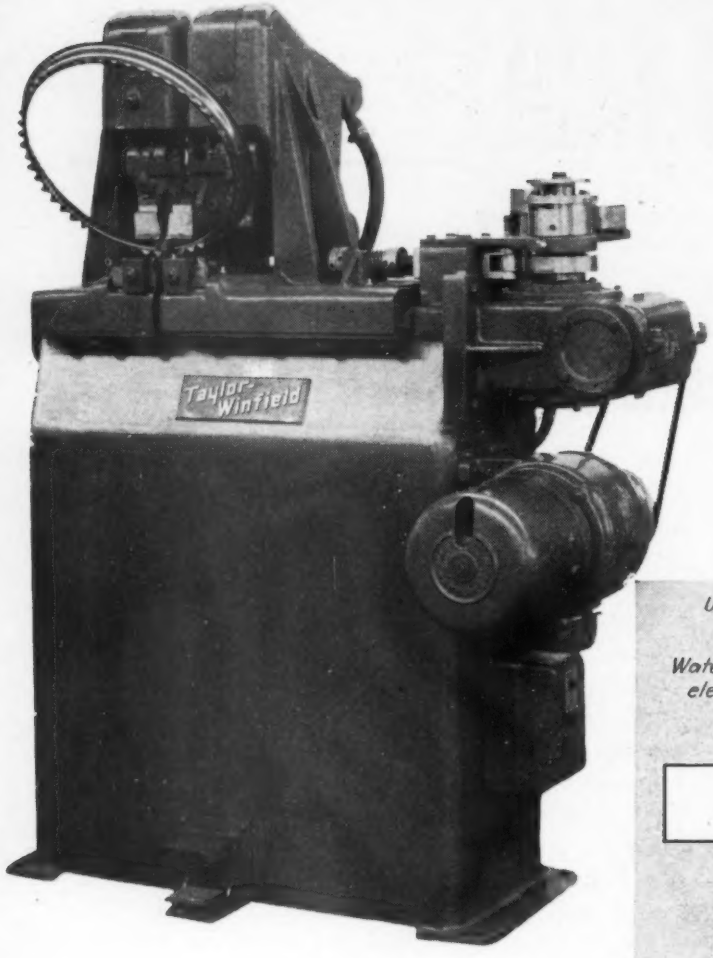
"I still believe that nobody works any harder than he thinks he's got to. You gotta ride the job through, or the boys will ride you. They might get mad, but they respect you."

"I doubt that, Ed. Nobody respects a guy who keeps needling and hammering. He's got to show the gang why each job is important and why it's important to them to get it done. Just throwing orders around doesn't work any more, Ed, even in the Army."

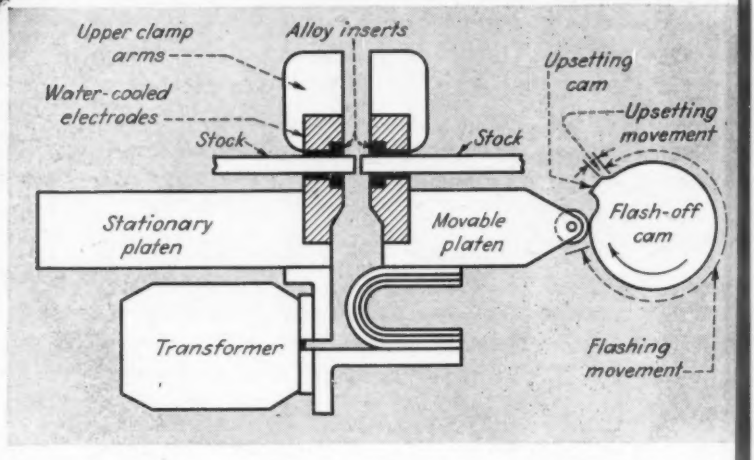
"Well, when things get to the point that the wheedlers inherit the earth, Al, I'll be ready to retire. And I expect to work a long while yet!"

***HOW SHOULD** an expediter get his work done—by threats, orders and force, or by trying to win cooperation? Can either method work alone, or is a combination the answer? You've known expediters; tell other readers your opinions and ideas. Discussions of earlier topics appear on later pages.*

High speeds, closer tolerances and little preparation of parts make flash welding a useful and inexpensive method of assembly for stainless steel parts in the automotive and sheet metal fabricating industries



Stainless steel rings are rapidly assembled on modern flash welders. In this motor-driven unit, alignment is maintained by water-cooled electrodes with alloy inserts



RESISTANCE WELDING OF STAINLESS STEELS . . . 3

Flash-Welding Variables

BY J. J. RILEY
WELDING ENGINEER, THE TAYLOR-WINFIELD CORPORATION

THE AUTOMOTIVE industry, quick to embrace and develop any technique that will help lower manufacturing costs, flash-welds stainless steels in making bumpers, cowls, trim molding and engine components such as valves and exhaust pipes. Other industries use this rapid and inexpensive assembly method to make cafeteria equipment, sinks, containers, window casements, door frames and other exterior trim. Flash welding, although a resistance-welding process, differs fundamentally from other welding processes.

A flash welder has a movable platen mounted on ways accurately aligned with a stationary platen and insulated from it. During the welding cycle, the movable platen is advanced toward the stationary one with controlled motion by a suitable mechanical cam, or by hydraulic action. Each platen supports a clamping mechanism and a current-carrying electrode shaped to the contour of the part being welded.

There are two basic actions in making a flash weld, flashing and upsetting. When the parts to be welded are brought into light contact, the average finish of the abutting surfaces will produce a number of minute contacts. Passage of a high-amperage current through these contacts melts them rapidly and causes a shower of sparks. The explosive and burning action of flashing continues as new points of contact are made by the advancing movable platen.

Flashing cleanses the weld area of impurities and simultaneously heats the metal adjacent to the molten surfaces to the plastic state. When the proper degree of plasticity

is attained, the velocity and force on the movable platen drastically increases, flashing stops and upsetting begins. The welding current is now cut off. The increased force forges the parts together, extruding the molten metal and upsetting a portion of the plastic metal beyond the previous periphery of the weld area. Approximately 65% of the platen travel takes place during flashing and the remainder during the upsetting or forging operation.

Advantages of flash welding are high speed, little or no preparation of parts for welding, close tolerances of finished product, and the welds have physical properties more similar to the parent metal than welds made by any other process. Applications are primarily restricted to butt joints and particularly those in which the weld components are of equal size as well as symmetrical in shape and cross-sectional area. This feature must be recognized in parts designed for flash welding.[1]

The characteristics of stainless steels require a specific flash-welding technique as heat accumulated in the parts while flash welding is greater than that resulting from spot and seam welding.

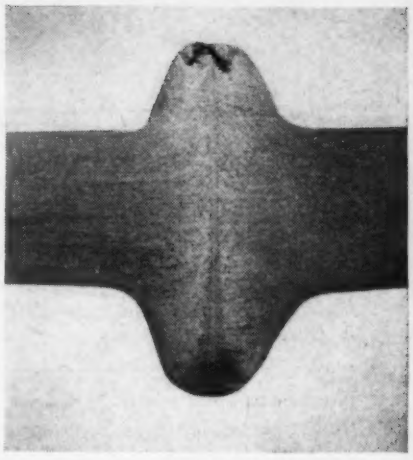
Parts must be welded as rapidly as possible to avoid excessive carbide precipitation in austenitic stainless steels and excessive grain growth in ferritic stainless steels. A rapid welding rate also minimizes distortion and promotes closer tolerances in the finished product. Modern automatic flash-welding equipment helps maintain consistent performance for short welding times.

The narrow plastic range of stainless steels requires large upsetting forces, standard types calling for 25,000 psi. of cross-sectional weld area. Those special types which have extra high compressive strength at elevated temperatures require from 35,000 to 50,000 psi. Expressed in terms of ordinary low-carbon steel, from 2½ to 5 times the upset force is required to weld an equivalent section. The great upset forces require rigid welder construction to reduce deflection and prevent misalignment of the weld surfaces. Serious weld misalignment destroys anticipated weld-joint strength.

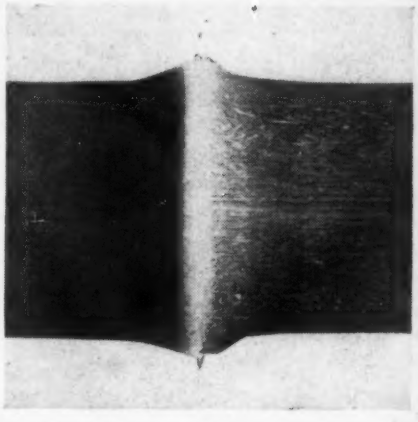
Parts must be prevented from slipping while the upsetting force is applied. If the shape of the parts is such that backups can be used, the clamping electrodes, made of RWMA Class No. 2 or 3 alloy, need only supply force to conduct current to the parts without marking and to maintain alignment. If a clean stainless steel surface is used, the clamping pressure would be 3,000 psi. over a minimum area, equal to five times the weld area. When the welding parts cannot be backed up, the clamping force should be approximately four times the upsetting force.

Proper electrode or die contour and good contact with the parts help prevent weld misalignment and die burns. Die burns occur in the welded part at the edge of the die and look similar to a crack except for the discoloration. They are caused by high current concentrations in these areas. In the average welder, current is admitted from the lower electrodes only, and such design will work satisfactorily if the weld diameter is ¾ in. or less. For larger diameters, both upper and lower dies must conduct current to minimize the possibility of these markings. Nevertheless, no design of welder electrodes will produce satisfactory results if the surface of the stainless steel is not free from dirt, grease or scale.

The rapid rate of welding and the high resistivity of stainless steels require a higher secondary or welding voltage than that used for low-carbon steel and it must be high enough to prevent butting or stalling. Stalling causes flashing to stop momentarily as the parts butt together, causing erratic heating; most of the benefits of the flashing action are lost. Welding current during the flashing period is also very erratic and cannot be measured accurately



Flow lines diverted from the normal in the joint in 302 stainless have little effect on physical properties of the weld



A difficult joint between tool steel and stainless steel, the stainless (right) working at the higher temperature

[1] *"Flash-butt welded joints—their design properties," Bulletin No. 12, Resistance Welders Manufacturers Association, Philadelphia, Pa.*

FLASH-WELDER CAPACITIES

RWMA Size	TRANSFORMER RATING-KVA	MAXIMUM UPSET FORCE	WELDED AREA OF STAINLESS* (Not including closed rings on bands) MIN. SQ. IN.	MAX. SQ. IN.
1	20	2,250	0.02	0.09
2	50	4,500	0.04	0.18
3	100	11,500	0.10	0.46
4	150	19,600	0.18	0.78
5	250	38,000	0.35	1.52

Note — For such types as 302, 304, 321, 430. For special heat-resistant stainless steels with high compressive strengths at elevated temperatures, maximum area should be reduced 30%*

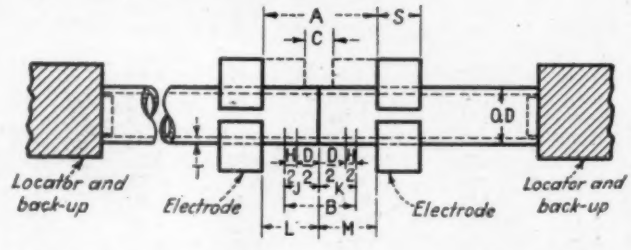
Trouble Shooting in Stainless Steel Welds

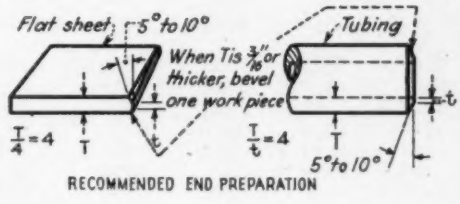
TROUBLE	CAUSE	REMEDY
Flashing is erratic and continually stops without butting.	*Rate of platen travel is too slow or cam contour improper.*	*Increase speed of platen or increase flash-off cam rise.*
Flashing is erratic and stops with butting or stalling.	*Secondary voltage too low.*	*Raise transformer tap switch.*
Flashing is erratic and stops with butting or stalling.	*Speed of platen is too rapid or cam contour improper.*	*Decrease speed of platen or decrease flash-off cam rise.*
Parts stall and overheat before flashing starts.	*Initial contact area too large.*	*Reduce initial contact area by beveling one or both parts.*
Welds are porous and contain inclusions.	*Parts are slipping during the upsetting period.*	*Increase clamping force or use backups.*
Welds are slightly porous and contain inclusions.	*Current flow is stopping before upset, causing oxidation.*	*Cut off current after upset is complete.*
Welds are weak and have a small upset with a sharp slope.	*Flashing dimension is too small to attain proper plasticity.*	*Increase heat input by increasing flash-off dimension.*
Welds are weak and have a large upset with a flat slope.	*Flashing dimension is too large causing an excessive depth of plastic zone.*	*Reduce heat input by decreasing flash-off dimension.*
Welds are continually misaligned while dies are properly aligned.	*Final die opening too large.*	*Decrease final die opening to increase rigidity of parent metal between dies.*
Welds are misaligned and have uneven heat marks.	*Dies are not contacting uniformly over the contact area.*	*Shim or machine dies until heat mark is uniform around periphery.*
Welds flash properly but indicate various degrees of overheating.	*Upset current timing is inconsistent.*	*Repair or replace upset current timer or welder contactor.*
Die burns or cracks are evident near weld.	*Current is concentrating instead of entering part uniformly.*	*Improve or enlarge die contact with part, or make die of higher conductivity, copper alloy.*
Parts show pitting and marking after welding.	*Surface of parts is dirty or greasy.*	*Clean area where die contact is made.*
One part of weld has a larger upset than other piece.	*Part with lesser upset has not attained sufficient plasticity.*	*Increase initial extension of part with lesser upset.*
Welds are porous and contain inclusions.	*Upset dimension is insufficient to cause complete expulsion of molten metal.*	*Increase upset dimension.*

DIMENSIONAL ALLOWANCES FOR FLASH WELDING
(For tubing and sheets)

T in.	A in.	B in.	C in.	D in.	H in.	J = K in.	L = M in.	Flashing Time, Sec.	O.D. in.	S with Locator	S without Locator
0.010	0.087	0.057	0.030	0.040	0.017	0.029	0.044	0.40	0.250	0.375	1.00
0.020	0.156	0.101	0.055	0.070	0.031	0.051	0.078	0.65	0.312	0.375	1.00
0.030	0.225	0.145	0.080	0.100	0.045	0.073	0.113	0.85	0.375	0.375	1.50
0.040	0.287	0.182	0.105	0.124	0.058	0.091	0.144	1.10	0.500	0.375	1.75
0.050	0.350	0.220	0.130	0.153	0.067	0.110	0.175	1.35	0.750	0.500	2.00
0.060	0.406	0.261	0.145	0.180	0.081	0.131	0.203	1.65	1.000	0.750	2.50
0.080	0.529	0.344	0.185	0.236	0.108	0.172	0.264	2.25	1.50	1.000	3.00
0.100	0.637	0.412	0.225	0.282	0.130	0.206	0.319	2.85	2.00	1.25	
0.120	0.748	0.483	0.265	0.330	0.153	0.242	0.374	3.30	2.50	1.75	
0.140	0.862	0.552	0.310	0.382	0.170	0.276	0.431	3.85	3.00	2.00	
0.160	0.958	0.608	0.350	0.420	0.188	0.304	0.479	4.50	3.50	2.25	
0.180	1.053	0.663	0.390	0.457	0.206	0.332	0.527	5.25	4.00	2.50	
0.200	1.141	0.711	0.430	0.487	0.224	0.356	0.570	6.00	4.50	2.75	
0.250	1.298	0.798	0.500	0.548	0.250	0.399	0.649	8.00	5.00	2.75	
0.300	1.437	0.877	0.560	0.607	0.270	0.439	0.718	10.5	5.50	3.00	
0.350	1.587	0.957	0.630	0.660	0.297	0.479	0.794	13.5	6.00	3.25	
0.400	1.702	1.022	0.680	0.698	0.324	0.511	0.851	16.5	6.50	3.50	
0.450	1.789	1.069	0.720	0.727	0.342	0.535	0.894	19.0	7.00	3.75	
0.500	1.866	1.116	0.750	0.765	0.351	0.558	0.933	22.5	7.50	4.00	
0.550	1.950	1.160	0.790	0.790	0.370	0.580	0.975	25.0	8.00	4.25	
0.600	2.012	1.192	0.820	0.814	0.378	0.596	1.006	28.0	8.00	4.50	

Note—These data cover standard types of stainless in the 300 and 400 series and are based on welding without preheating, both pieces having the same welding characteristics





RECOMMENDED END PREPARATION

T = Tube wall or sheet thickness
A = Initial die opening
B = Material lost
C = Final die opening
D = Total flash-off
H = Total upset
J = K = Material lost per piece
L = M = Initial extension per piece
O.D. = Outside dia. of tubing
S = Minimum length of electrode contact

RESISTANCE WELDING OF STAINLESS STEELS
(continued)

with the average ammeter.

The working level of current varies between 5,000 and 10,000 amp. per sq. in. of welded area. During the upsetting period the current becomes steady and of large magnitude, averaging five times the flashing current. The large ratio of upsetting to flashing current is an inherent characteristic of the welding transformer and flash-welder circuit design. Heat input to the weld varies approximately as the square of the current.

In the average application, flashing current flows approximately 95 to 99% of the total heating period and the short upset current timing period requires precise control to prevent weld overheating. Improper control causes welds of low strength, welds burnt into two parts, and welds with varying degrees of carbide precipitation. Less precise timing is possible if some means is used to reduce artificially the magnitude of the upset current. Many production applications are equipped with devices to provide this effect.

Kva. demand during flashing is comparatively low (approximately 20% of the upset kva. demand) and the power-factor high (between 80% and 90%). This inherent characteristic has made it possible to weld such large areas as 50 sq. in. of low-carbon steel with a welder rating of only 1,500 kva. at 50% duty cycle. Had there not been mechanical limitations, an equivalent area of stainless steel could have been welded.

Chart Welder Capacities

Although flash welders are being designed in accordance with the standards of the Resistance Welder Manufacturers Association, selection of proper welder rating is not a simple procedure. The chart of welder capacities in terms of stainless steel is based on these equip-

Since flash welds are made from the parent metal without filler rod, they can be made with physical properties similar to the parent metal. Flash welds in Type 302 stainless steel show the fiber of the steel diverted from its normal flow direction by the forging action. Such twisting of flow lines normally has little effect on the physical characteristics of the weld.

The metallographic structure in and adjoining the weld is changed by heat of welding. Any carbide precipitation caused by welding can by eliminated by heating to 1950 F. and quickly quenching. However, excessive grain growth cannot be reduced by further heat-treatment alone. In static tensile tests, "as welded" specimens will generally fail outside the weld. If the parent

metal is cold-worked before welding, failure will occur in or close to the weld. The effect of cold-working may be considerably reduced in the weld zone by the heat of the welding operation.

Numerous flash-welding applications involve the welding of stainless steels to low-alloy steels or low-carbon steel. The stainless part of the product works at high temperature while the inexpensive, but strong, low-alloy steel works at low temperature, thus providing a relatively low-cost product assembly.

Flash welding of stainless steels has not progressed sufficiently to compile an exact dimensional loss chart to cover all steels, but the welder settings shown in accompanying tables should serve as a working guide in product design and in manufacture. Slight variations in these dimensions may have to be made in accordance with suggestions given here, which indicate the evidence of correction for inferior welding results.

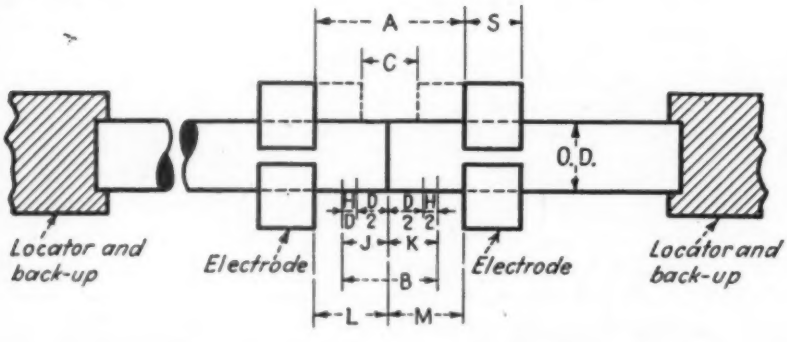
In applications where either a plain low-carbon steel or low-alloy steel is to be welded to a stainless steel, the initial extension of the stainless part should be twice as large as that of the low-carbon steel part. This procedure is used to equalize the heat balance and promote nearly equal degrees of plasticity for both steels and a more uniform joint.

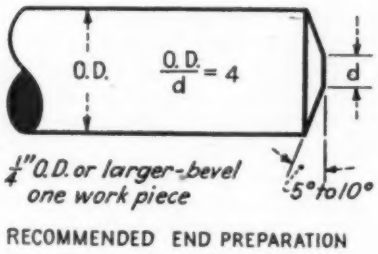
DIMENSIONAL ALLOWANCES FOR FLASH WELDING
(For solid bars, round, hex, square and rectangular)

O.D. in.	A in.	B in.	C in.	D in.	H in.	J = K in.	L = M in.	Flashing Time, sec.	O.D. in.	S with locator	S without locator
0.050	0.100	0.050	0.050	0.040	0.010	0.025	0.050	0.40	0.250	0.375	1.00
0.100	0.182	0.082	0.100	0.062	0.020	0.041	0.091	0.75	0.312	0.375	1.00
0.150	0.270	0.120	0.150	0.090	0.030	0.060	0.135	1.15	0.375	0.375	1.50
0.200	0.350	0.150	0.200	0.110	0.040	0.075	0.175	1.50	0.500	0.375	1.75
0.250	0.430	0.180	0.250	0.130	0.050	0.090	0.215	1.90	0.750	0.500	2.00
0.300	0.510	0.210	0.300	0.150	0.060	0.105	0.255	2.25	1.000	0.750	2.50
0.350	0.600	0.250	0.350	0.180	0.070	0.125	0.300	2.75	1.50	1.000	3.00
0.400	0.685	0.285	0.400	0.205	0.080	0.143	0.343	3.25	2.00	1.25	
0.450	0.770	0.320	0.450	0.230	0.090	0.160	0.385	3.75	2.50	1.75	
0.500	0.850	0.350	0.500	0.250	0.100	0.175	0.425	4.25	3.00	2.00	
0.550	0.940	0.390	0.550	0.280	0.110	0.195	0.470	5.00	3.50	2.25	
0.600	1.025	0.425	0.600	0.305	0.120	0.213	0.513	5.50	4.00	2.50	
0.650	1.100	0.450	0.650	0.325	0.125	0.225	0.550	6.75	4.50	2.75	
0.700	1.180	0.480	0.700	0.350	0.130	0.240	0.590	7.50	5.00	2.75	
0.750	1.260	0.510	0.750	0.375	0.135	0.255	0.630	8.25	5.50	3.00	
0.800	1.340	0.540	0.800	0.400	0.140	0.270	0.670	9.00	6.00	3.25	
0.850	1.420	0.570	0.850	0.425	0.145	0.285	0.710	9.75	6.50	3.50	
0.900	1.500	0.600	0.900	0.450	0.150	0.300	0.750	10.50	7.00	3.75	
0.950	1.580	0.630	0.950	0.475	0.155	0.315	0.790	11.75	7.50	4.00	
1.000	1.660	0.660	1.000	0.500	0.160	0.330	0.830	13.00	8.00	4.25	
1.050	1.740	0.690	1.050	0.525	0.165	0.345	0.870	14.75	8.00	4.50	
1.100	1.820	0.720	1.100	0.550	0.170	0.360	0.910	16.50	9.00	4.75	
1.150	1.900	0.750	1.150	0.575	0.175	0.375	0.950	18.25	9.50	5.00	
1.200	1.980	0.780	1.200	0.600	0.180	0.390	0.990	20.00	10.00		
1.250	2.060	0.810	1.250	0.625	0.185	0.405	1.030	22.50			
1.300	2.140	0.840	1.300	0.650	0.190	0.420	1.070	25.00			
1.400	2.300	0.900	1.400	0.700	0.200	0.450	1.150	30.00			
1.500	2.460	0.960	1.500	0.750	0.210	0.480	1.230	38.00			
1.600	2.620	1.020	1.600	0.800	0.220	0.510	1.310	45.00			
1.700	2.780	1.080	1.700	0.850	0.230	0.540	1.390	54.00			
1.800	2.940	1.140	1.800	0.900	0.240	0.570	1.470	63.00			
1.900	3.100	1.200	1.900	0.950	0.250	0.600	1.550	75.00			
2.000	3.260	1.260	2.000	1.000	0.260	0.630	1.630	90.00			

Do not recommend without use of backups

Note—These data cover standard types of stainless in the 300 and 400 series and are based on welding without preheating, both pieces having the same welding characteristics. The values apply only when ratio of maximum to minimum cross-sectional dimensions is less than 1 to 1.5





RECOMMENDED END PREPARATION

O.D. = Diameter of rounds or minimum dimension of other sections
A = Initial die opening
B = Material lost
C = Final die opening
D = Total flash-off
H = Total upset
J = K = Material lost per piece
L = M = Initial extension per piece
S = Minimum necessary length of electrode contact

Practical Ideas

Toolmaker's Buttons Establish Accurate Angles and Straightedges

S. FRAMURZ
BOMBAY, INDIA

Here is an extremely simple method of checking or developing angles of 60° and 120° with great precision. No measurements with micrometer, slip gages, sine bar or clinometer are necessary; besides, the equipment is more compact and in many cases would prove handier and more versatile than a sine-bar fixture. Three reference disks of any identical diameter are placed touching each other on a flat ground plate, on which their centers are located approximately. The plate is then drilled and tapped for screws or bolts of diameter less than the bore in the disks. The three disks are then merely bolted down on the plate so that all three are in contact, each with the other two, simultaneously. This would give a master gage for angles of 60° and 120°.

Since reference or master disks usually have a tolerance of 0.00004 in. or less, calculation will show that even under the most unfavorable conditions of tolerance, the angles ACD and BCD will be accurate to within a few *seconds* of arc of the absolute 60° and 120° angles respectively. Even higher accuracy is possible with matched disks.

Of course lines AB and CD are actual precision straightedges, or true lines drawn using a precision straightedge. A templet may, however, be directly applied to the gage provided its sides have been independently checked for straightness.

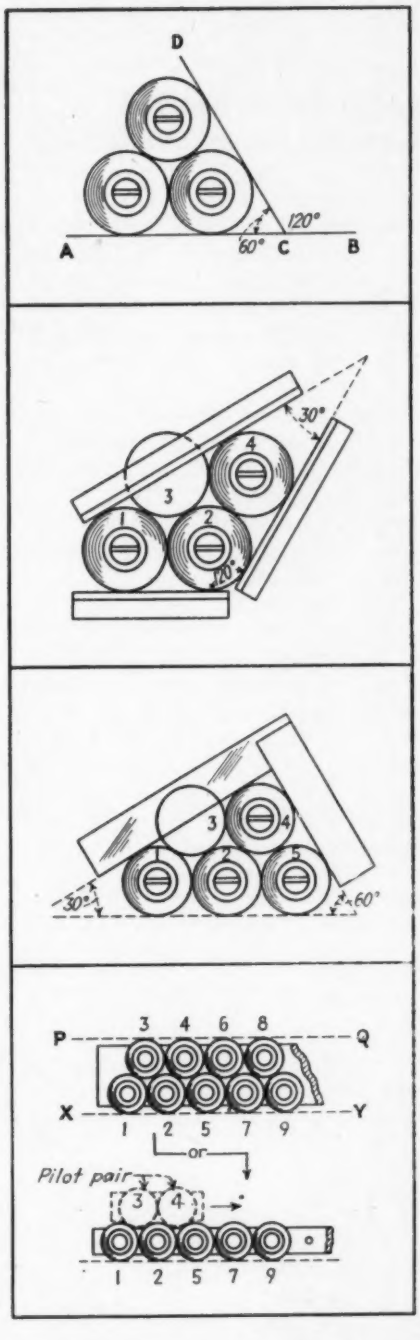
Theoretically, the number of different angles which can be obtained with this method—which may appropriately be called the contiguous disks method—is infinite. But only three more arrangements will be shown here to give an idea of the potentiality of the method.

The disks can be arranged to obtain a precision angle of 30° in several ways. The disks are first fixed on to the plate in the order 1, 2, 3 and 4, and then disk No. 3 is carefully removed so as not to disturb the others. From the geometry of the figure, it is evident that the common tangents to disks 1 and 4, and 2 and 4 respectively, subtend an angle of 30°. This arrangement also gives a direct setting for the 120° angle.

30°, 60° and 120° are, however, not the only whole angles possible. A combination master gage for 30°, 60° and 90° could be set up. Five disks are used and are fixed to the base block in their numerical order, and No. 3 is then removed without disturbing the others. The common tangents to disks 1 and 4, and 4 and 5 respectively, subtend an angle of 90°. The importance of the fact that an accurate right angle could be set up from scratch by this method with such ease, needs no emphasis. It provides a practical method of testing set squares.

Another interesting characteristic that manifests itself in the preceding setup is that—if the disks are identical in diameter within very fine limits (as has been assumed throughout, indeed)—the common tangent to disks 1 and 2 must also touch disk 5, thus providing a simple means for obtaining a precision straight line. So, I took this fact to its natural conclusion and made a setup for a precision straightedge. X Y is a common tangent to disks 1, 2, 5, 7 and 9 and P Q is tangent to disks 3, 4, 6 and 8. PQ and XY, of course, are parallel. The straight line can be constructed with a single row of disks using this principle, with two pilot disks to extend the row. Disks 3 and 4 establish disk 5; then 3 and 4 are moved over one place to establish disk 7 and so on.

All the foregoing setups are re-



Four toolmaker's button setups showing the ease of checking any multiple of 30° by placing three or more buttons in mutual contact. The bottom picture shows how a straight line may be laid out with as many points as desired using nothing but circles

versible in their function. That is, they can be used to check the identity of diameters of the disks. Thus, given a precision straightedge, this last arrangement becomes a test set-up for checking the identity of diameters of the disks. The larger the number of disks used, the more sensitive is the test.

Special Holder Aids Bolt Circle and Radial Drilling

PETER RIGGIO

Small flanges and gear hubs requiring an even number of holes are easily drilled with this equipment.

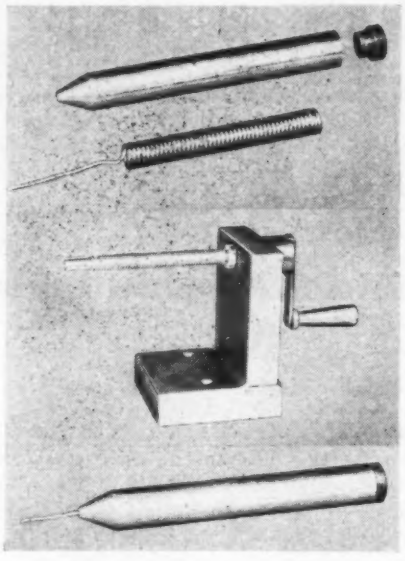
Holders are standard square, hex and octagon bar stock, about 4 in. long, each with a ⅝-in. hole in one end.

Adapters are made to fit the holder providing a wide assortment of standard threads. A 10-32 setscrew locks the adapter.

A vertically-held V-block positions the holders and their shape controls the indexing.

The first hole must be laid out with care, but that is all. The piece is then assembled so it and the holder are temporarily, at least, locked together.

After the first hole is drilled, don't move anything, except to turn the holder one step and proceed around. All holes will be equally spaced and symmetrical to the first.



Spun-down aluminum tube makes convenient solder magazine. An 8-ft. length of solder is cut off, wound into tight coil, and inserted

Handy Solder Holder

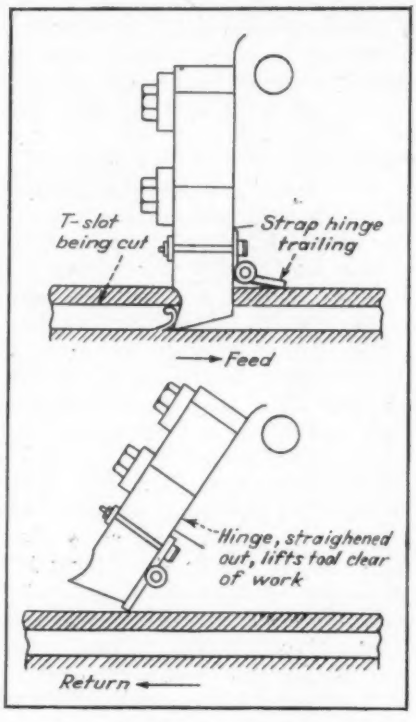
O. STROM
Westinghouse Electric Corporation
East Springfield, Mass.

This handy solder holder has proved to be very convenient on jobs where a small amount of solder is used at one time.

The solder holder is nothing more than a piece of tubing 8 in. long, with one end spun down to a diameter slightly larger than that of the solder used, with a wood plug for the other end. The holder takes a piece of solder approximately 8 ft. long, wound into a ¾ in. diameter coil on the hand winding fixture, and one end is straightened out so the coil can be started through the small end of the holder.

A spool of solder is too heavy to handle so the usual procedure is to cut off pieces of suitable length. This results in waste due to short ends and lost pieces.

The new solder holder not only eliminates this waste but also realizes a labor savings in that pieces do not have to be cut so often and the holder does not get lost or misplaced.



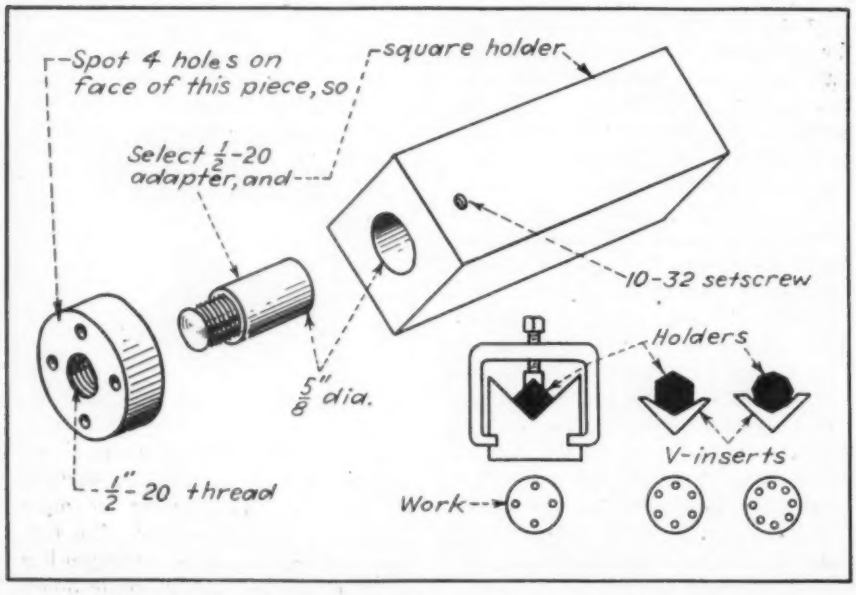
Cutting a T-Slot: hinge trails during feed stroke but bridges gap and lifts tool clear during return

Hinge Lifts Planer Tool Clear of Deep Slots

JOSEPH J. URELLO
Bethlehem, Pa.

Undercutting a surface on a planer—dovetails and T-slots for example—requires that the operator catch the tool at the end of the stroke and lift it clear of the slot, and probably hold it during the return stroke besides.

Getting tired of this, I hit on



Assorted holders and adapters make flange drilling easy

the idea of bracketing a small butt hinge to the toolbit itself so the pin would just clear the top surface of the work on the cutting stroke with the other half of the hinge trailing. Then, at the end, this trailing half dropped down, making a wide, smooth and soft (if a brass hinge is used) support to bridge the slot and lift the tool and clapper all the way out and carry it back for the next cut.

Powered Toolbit Honer Produces Sharper Tools

HERBERT WEITZ
Union, New Jersey

When a toolbit is reground, examination under a microscope shows the cutting edge to be a series of sawtooth peaks. These are worn away as the toolbit is used and a dull tool soon results. Honing a toolbit after grinding reduces these peaks to a true-cutting edge-line and this practice produces a smooth, keen cutting edge which outlasts by many times a toolbit which has not been honed.

Almost every toolmaker and lathehand is aware of these facts. They also know that an improperly honed toolbit can perform worse than one which is left alone after grinding. It takes quite a bit of experience before the knack of hand-honing can be acquired so a straight honing motion is imparted to the tool.

This drillpress-driven honing fixture will prove useful to the mechanic who is unwilling to wait until he develops the knack of hand honing. It leaves both hands free to hold and guide the toolbit while the honing stone reciprocates past the tool cutting edge in an absolute true straight-line motion.

The construction of the tool is simple. The reciprocating oilstone carrier is a deep U-shaped block which slides on the base. The drive shaft, a 10-in. piece of drill rod, rests in the bottom of the milled groove and is pinned in three places through the sidewalls of the block. The stone rests in the groove on top of the rod and is clamped with four setscrews and a copper gib. The cam bearing end of the shaft and holder block assembly is hardened and polished.

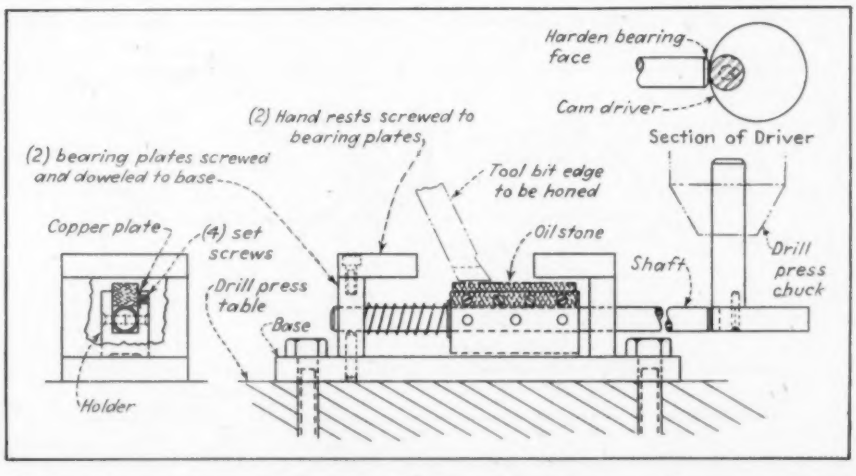
The frame of the fixture is made up of a steel base and two steel endplates which act as bearings for the shaft. If desired, brass or bronze sleeve bearings can be inserted in the end-plates. A steel plate is fastened to each bearing plate to act as a hand rest. A good fit is essential between the shaft centers and the sliding portion of the holder block as a radial movement of the holder block is undesirable. The shaft and holder-block assembly is prevented from moving radially because any pivoting tendency of the shaft is restrained by the two bearing points on the block contacting the base.

A washer is set against the holder-block and a spring is set over the shaft and pressed against this washer, the other end of the spring bearing against the left end-plate. The spring must be strong enough to return the shaft and holder assembly while under normal honing pressure.

The cam-driver is made up of a steel shaft turned down at one end and pressed into a 1½-in. diameter steel plate so that the shaft and plate diameters are tangent with the shaft inside the plate. A dowel pin pressed into the plate and turned portion of the shaft acts as a key to prevent possible rotation.

In fastening this fixture to the drillpress table there should be a little space allowed between the holder block and right bearing plate when the cam-driver is rotated to a minimum position. This will prevent the cam from leaving the shaft and causing a bumpy action from the holder block hitting the bearing plate.

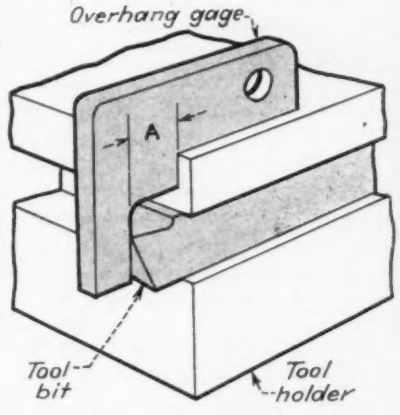
The drillpress should be driven at a low rate of speed for best results.



Uniformly straight reciprocating motion hones tools to a keener, longer-lasting cutting edge

Flat Gage Repositions Toolbits in Square Turrets

J. H. QUATKEMEYER
Cincinnati, Ohio



One overhang setting for all tools not only simplifies tool adjustments, but gives the cross feed micrometer permanent radius values

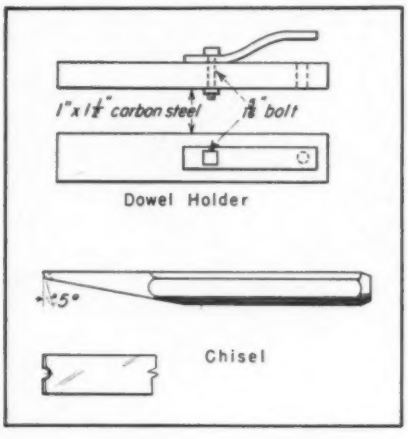
Regrinding single-point tools as used in fairly complicated turret set-ups can be annoying because of the necessity for careful measurements in order to replace the tool in exactly the same place, or else to change the adjustments and learn new settings for the cross-feed micrometer.

This simple easy-to-make hook gage is so small that it is never in the way if left right on top of the turret or toolholder where it will be always available. Using it will mean that all tools (except in very special cases) will be set with the same overhang, plus or minus 0.001 in. or so, and the cross-feed micrometer graduations can be converted directly in radii for any job.

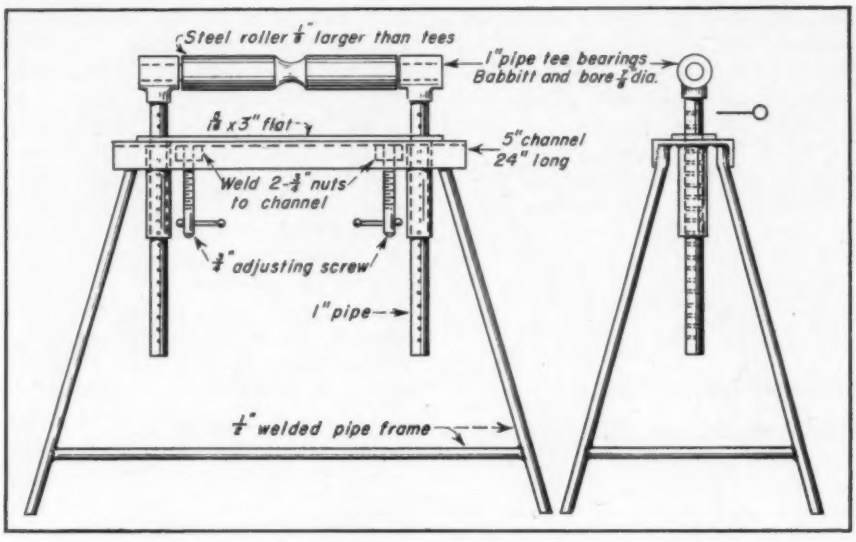
Hints On Small Tools

EARL R. GODDARD
Denver, Colorado

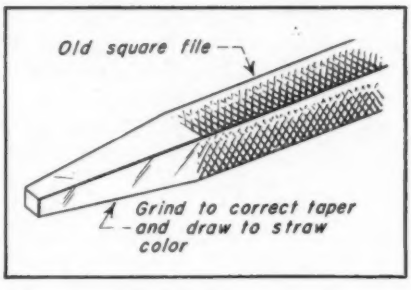
Dowel Cutter—The number of pieces in a job always determines the method used. We had to make about 50 short pins of uniform length so we decided upon this setup. The dowel holder is clamped to the bench with the hole horizontal so the bar stock can be fed to it along the bench. The stop is soft and can be bent to adjust the length. Cutting is accomplished with a cold chisel ground as shown. The time and material cost for these tools was very low and for such a short run job, and the slight extra production time was negligible.



Roller-Horse—No shop ever has too much equipment for handling long and heavy pieces of stock. Table saws, planers, grinders, and milling machines are sometimes required to take a job just a little longer than the table will hold, or perhaps a load of stock has to be moved. Adjustable horses of this type will fill the bill economically, performing the double function of table extension for machines and temporary conveyor. The horse is built largely from standard pipe fittings and there is practically no machining required.


Steel roller ¼" larger than tees
1" pipe tee bearings Babbitt and bore ⅞" dia.
⅛ x 3" flat
5" channel 24" long
Weld 2-¾" nuts to channel
¾" adjusting screw
1" pipe
¼" welded pipe frame

Taper Reamer—A special reamer can be made in an emergency very quickly by grinding and tempering the end of an old square file. Just determine the correct angle for one side by dividing the total taper in half and make a simple guide to assure a straight grind.



Extension Center Permits Accuracy On Old Lathes

CARMEN J. RODRIQUEZ
FITCHBURG, MASS.

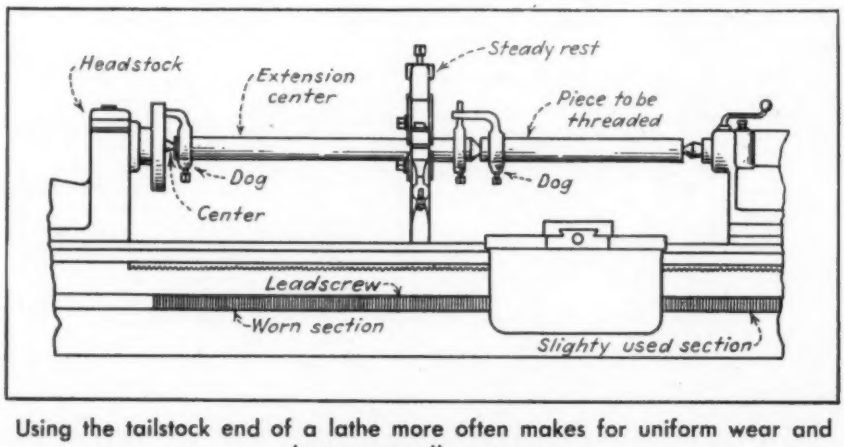
Leadscrews always wear more near the headstock than anywhere else because the bed is longer than necessary for most work. It is comparatively seldom that a job will push the tailstock all the way back.

Just on general principles, then, it's a good idea on new lathes to equalize the wear, not only on the leadscrew but on all sliding surfaces as well. Much work has to be chucked or clamped on the faceplate anyhow so it can't do any harm to uitilze the other end when possible.

The setup is simple. All you need is a long piece of shaft, pointed like a standard center at one end and drilled to receive the headstock center at the other end. Three dogs and a steadyrest hold and drive the extension center.

When there are a number of short pieces to thread, for example, the steadyrest should be mounted near the end of the extension. But when you want to turn one heavy piece, it might be better to put the rest on the work itself.

By following this practice regularly, you will be able to thread a long shaft with uniform accuracy for its full length when the occasion arises.



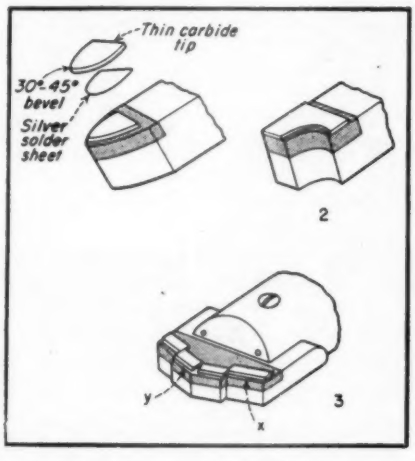
Using the tailstock end of a lathe more often makes for uniform wear and better overall accuracy

Chipbreakers Brazed-On When They Can't Be Ground

W. B. KENNEDY
Watertown, Massachusetts

In cases where it would be difficult or impossible to grind a chipbreaker in special carbide tools at Watertown Arsenal, I specify a thin beveled carbide tip brazed on top of the original tip. On toolbits with other-than-straight edges, the tip is ground to the contour of the tool before brazing.

When a tool requires regrinding, heat the chipbreaker-tip and simply push it back the distance equal to the amount of metal to be ground off the cutting edge. On a two-step boring cutter for deep-hole boring grinding a chipbreaker at "X" would probably cut into the leading cutter tip. The chipbreakers at "Y" could, of course, be ground in the conventional way, but it would make the cutting edge lower than at "X." This cutter is used for a boring steel cylinder with cored centers, so the point of the cutter does no cutting.

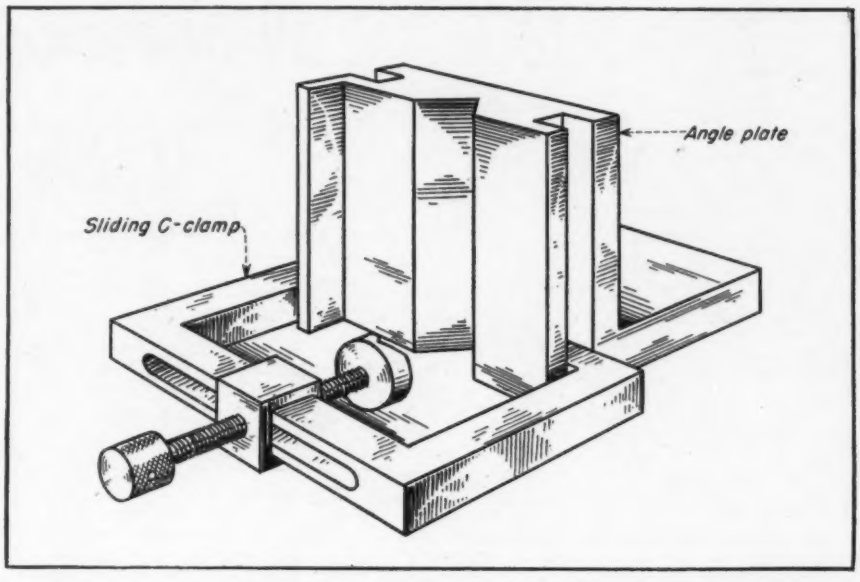


Chipbreakers for form-tools can be made by brazing on thin carbide tips.

Angle Plate Clamp For Grinding Setups

WALTER DIMITRUK

I used to have trouble grinding pieces that had to be held in an angle plate because of the awkwardness of having to hold a piece of work against an angle plate with one hand, hold an angle plate with the other hand and then somehow tighten a free C-clamp or parallel clamp onto the work and angle plate. Then I thought of this easy arrangement which saves time and is much more easily handled.



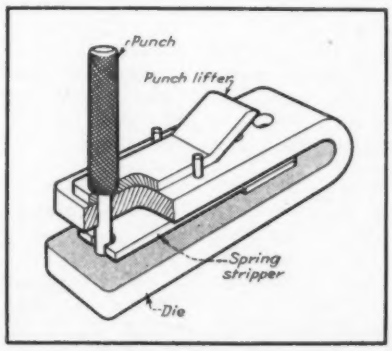
Double sliding clamp simplifies work positioning when screws or other fastenings aren't permissible

An angle plate is grooved along the sides and a clamp is fitted into this groove. A slot is put in along the back of the clamp to allow a screw to be slid freely along from one side of the angle plate to the other. The tip of the screw has a V-groove for holding round work. Naturally, the tip of the screw has a brass attachment so as not to mar the work. With this angle plate, the operation is much simpler.

Hand Punch and Die for Light Sheet Metal Work

MARTIN H. BALL
Watervliet, N. Y.

Maintenance and repair shops and many jobbing shops make small sheet metal parts on which there are no particular tolerances as long as the piece fits and does its job. These parts often require holes for bolts, screws or rivets. Here is a way to punch the holes with a blow of a hammer eliminating drilling entirely.



Light hammer blow punches stock then a blow on the rockered lifter retracts the punch

The tool steel frame serves as punch holder and die.

The spacing block and the spring stripper plate are attached to the lower part of the frame by the two screws shown, which are passed through the clearance holes in the upper portion of the frame.

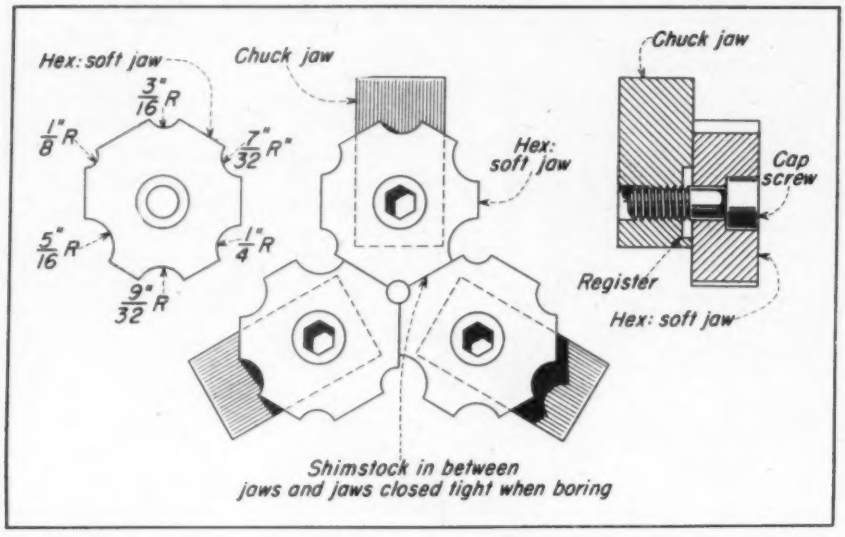
The punch has a shoulder which rests on a lever when the punch is just even or slightly below the top surface of the die.

The lever is kept in place by the punch and the two pins.

After punching a hole, the lever is tapped lightly with the hammer on its upturned end, thus raising the punch from the work enough to clear the work, and the hammer is allowed to rest on the lever while another piece of work is inserted.

The punch is prevented from jumping out of its guide by a pin which allows the punch to have up and down movement only as the flattened portion on its side allows.

The set can be fastened temporarily or permanently to the bench and the idea can be expanded by combining standard sizes, say ⅛, 3/16, ¼, 5/16, ⅜ in a row. Then a piece requiring several sizes could be punched without any delay for changing tools or positioning work.



Non-marring hexagon jaws are fitted to 3-jaw universal chuck so they can be individually indexed for six work diameters

Soft Hexagon False Jaws Improve Finish Operations

F. A. PRANGNELL
Sussex, England

In the workshop of which I have charge, I had to finish-turn a number of small components. Soft jaws were needed because the portion to be gripped was already finished. The jaws suffered as is usual and needed to be periodically rebored. We started off with the regular soft-jaws as supplied with the three-jaw self-centering chuck and frequent reboring meant renewing jaws. I therefore thought of using false jaws.

First, I counterbored each chuck jaw to take a register, tapping a ⅜-in. B.S.F. thread at the same time. I then made a number of soft jaws from hexagon material using mild steel and duralumin. Each jaw was made with a register-boss to fit the counterbore of the chuck jaw, and was centrally drilled with a ⅜-in. hole and counterbored in front to allow entry of the head of capscrew.

The set of false jaws were then bolted on to the chuck jaws and the chuck was closed with a piece of 0.020-in. shimstock in the three joints. This made the whole job nice and rigid for boring to the size for the component part to be held. Removal of the shims then gave ample extra travel on the jaws to securely hold the part. Note that this occupied one hexagon crest on each jaw.

We were therefore able to swing jaws around (by easing bolts) and bore each set of crests with different size holes, so enabling one set of three false jaws to do the work of six collets.

Actually, we required only one size so we merely ran off a batch of false jaws for stock. In use, when one position became worn, the jaws were indexed, presenting new surfaces. This was repeated six times, and then a new set was installed and the old set was saved for possible reboring to larger size for some future job.

In this way, new chucking surfaces were made available with the absolute minimum of delay.

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(in addition to regular payment for all exclusive contributions published)

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Judges—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, will hereafter select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. The decision of the readers will be final in each case.

Requirements—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

Who May Enter—Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments.

How to Enter—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St., New York 18, N. Y.

Sixteenth Selection—I. Diamond's Drill Extension

Fractional-hp. Motor Standards—I

STANDARDIZATION of 1/20- to ¾-hp. motors has been announced by the Motor and Generator Section, National Electrical Manufacturers Association, with respect to:

1. Dimensions of frame sizes.
2. Specific ratings and performance requirements.

In realization of the savings to be gained by machinery manufacturers, motor manufacturers and users, NEMA initiated a study of dimension standards in 1944. The new standards provide for three motor-frame sizes, as shown in the accompanying illustration. No horsepower and speed ratings are currently assigned to these frame sizes.

The dimensions apply to both rigid and resilient, or cushion-base, motors of 1/20 through ¾ hp., 1800 rpm. (1 hp., 3600 rpm.). The *H* dimension of the 13/32-in. slot and the *BA* dimension of 3⅛ in. in the largest frame has been established to match same dimensions applicable to the integral-horsepower 203 frame, to provide interchangeability on belt-driven machines using both fractional-horsepower and integral-horsepower motors.

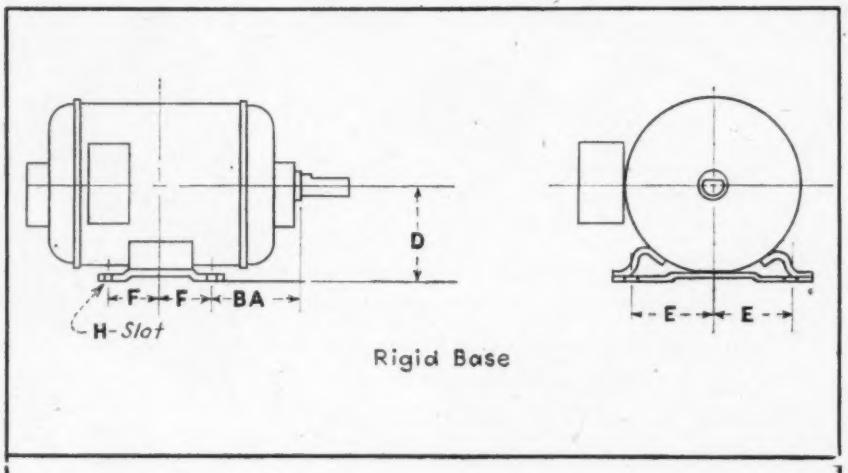
Standard frame numbers are used to make the dimension standards more useful and effective. This system is modeled after the integral-horsepower system, which employs frame sizes 203 to 505.

In the proposed frame-numbering system, the frame number will be 16 times the shaft height (*D* dimension). Thus, according to the illustration, the three frame sizes are 42, 56 and 66. The *BA*, *E*, *F* and *H* dimensions are constant for any given *D* dimension, or frame size. Suffix letters will be used to indicate the same features now indicated in the integral system. Therefore, the same frame numbers with proper suffix letters (when assigned) will be used for vertical and flange motors, as are designated for the horizontal motors of corresponding sizes. Prefix letters may be used by individual manufacturers, but will have no reference to standardized dimensions.

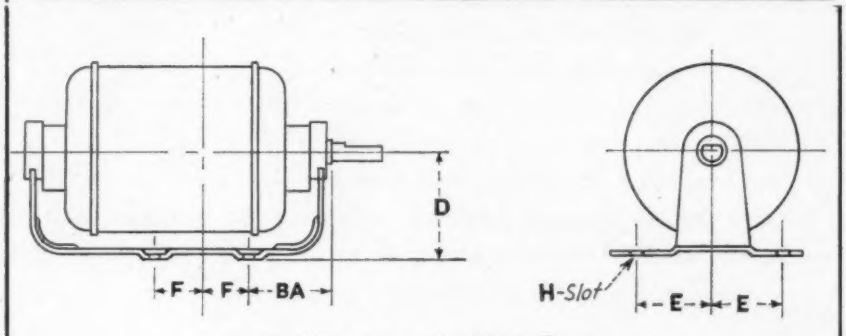
The new standards also give specific definitions of motor rating and performance in coordinated terms of horsepower rating, speed, breakdown torque and service factor. As a result of better standard definitions, the machinery or appliance manufacturer can obtain proper motors from all suppliers without having to go through exhaustive tests for each application. This is also important from the viewpoints of the ultimate user and installer.

In the past, the horsepower stamped on the nameplate of a fractional-horsepower motor has not always been a true indication of the motor's load-carrying ability, because of lack of standards to define horsepower rating in terms of speed and torque. The new standard overcomes this difficulty.

In application of fractional-horse-



Rigid Base



Resilient or Cushion Base

Frame Number *	Dimensions in Inches				
	D	E	F	BA	H
42	2 5/8	1 3/4	27/32	2	9/32" slot
56	3 1/2	2 7/16	1 1/2	2 3/4	11/32 slot
66	4 1/8	2 15/16	2 1/2	3 1/8	13/32 slot

* *Frame number system is proposed. See discussion of "Standard frame numbers"*

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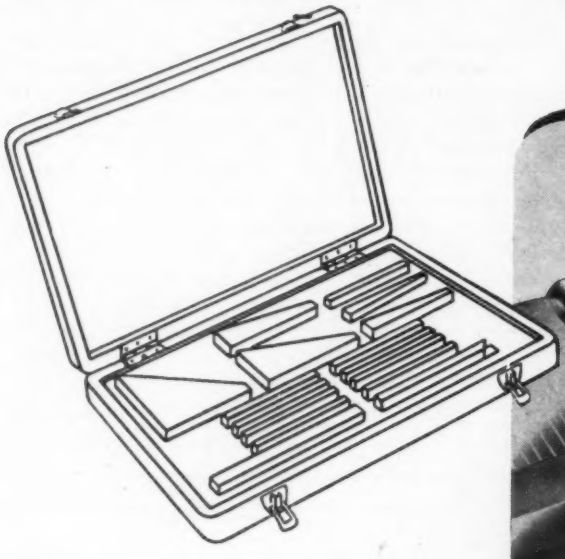

Application of Webber Angle Gage Blocks for setting angle on revolving magnetic chuck. Assemble proper combination of blocks that add up to desired angle; mount with parallel and indicate across top of assembly for accuracy.

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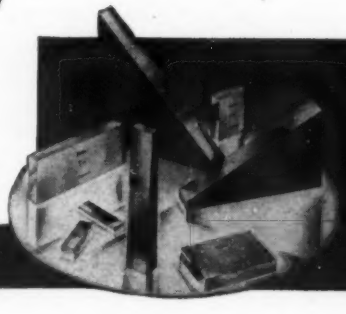


Webber PRECISION GAGE BLOCKS

Fractional-hp. Motor Standards—II

Table I—Breakdown Torque for Fractional-hp. Motors

Rpm. 3600 3450	3000 2850	1800 1725	1500 1425	1200 1140	900 Synchronous Rpm. 850 Approx. Full Load	Brake Hp. Rating
Breakdown Torque, Oz.-Ft.						
2.0- 3.7	2.4- 4.4	4.0- 7.1	4.8- 8.5	6.0-10.4	8.0-13.5	1/20
3.7- 6.0	4.4- 7.2	7.1-11.5	8.5-13.8	10.4-16.5	13.5-21.5	1/12
6.0- 8.7	7.2-10.5	11.5-16.5	13.8-19.8	16.5-24.1	21.5-31.5	1/8
8.7-11.5	10.5-13.8	16.5-21.5	19.8-25.8	24.1-31.5	31.5-40.5	1/6
11.5-16.5	13.8-19.8	21.5-31.5	25.8-37.8	31.5-44.0	40.5-58.0	1/4
16.5-21.5	19.8-25.8	31.5-40.5	37.8-48.5	44.0-58.0	58.0-77.0	1/3
21.5-31.5	25.8-37.8	40.5-58.0	48.5-69.5	58.0-82.5	——	1/2
31.5-44.0	37.8-53.0	58.0-82.5	69.5-99.0	——	——	3/4
44.0-58.0	53.0-69.5	——	——	——	——	1

Note 1. Breakdown torque range includes the higher figure, down to, but not including the lower figure.

power induction motors, select a breakdown torque which is sufficient to take care of maximum peak-load requirements. Breakdown torque is the maximum torque which the motor will develop without an abrupt change in speed. So that the new standards will serve to provide a definition of rating of any particular motor design, the complete range of breakdown torque is divided into bands for the various standard horsepower ratings. A series of torque values associated with corresponding horsepower ratings provides a definite classification of any motor in terms of horsepower ratings. The values given in Table I show the range of breakdown torque for various horsepower ratings.

Load-carrying ability is also defined in relation to service factor. Fractional-horsepower motors of the open 40 C. rise continuous rating, referred to as general-purpose motors, have a lower temperature-rise rating than certain motors designed for specific duty and load conditions, which are rated 50 C. rise (open) or 55 C. rise (totally inclosed). These temperature rises are recognized by industry as the maximum compatible with long insulation life.

Users of fractional-horsepower motors, when applying 40 C. rise motors on specific applications and known load conditions, have recognized that these motors may be operated safely at continuous loads greater than the horsepower rating on the nameplate. So such users have desired recommendations regarding safe continuous overloads, considering the inherent 10 C. margin of safety of these motors. This inherent overload ability is referred to as the service factor.

As compared with motors of larger rating (these have a service factor of 1.15), fractional-horsepower motors have a higher overload ability, because of their physical size and value of breakdown torque. Service factors given in Table II thus define the loading that will give a total temperature rise of 50 C. on a general-purpose, fractional-horsepower motor having a nameplate rise of 40 C. Thus, a 40 C. motor having a 1.4 service factor may be operated continuously at 140% of full load. And when authorized by the manufacturer, such a motor may be operated (at rated voltage and frequency and in an ambient temperature not exceeding 40 C.) at a continuous load greater than rated load determined by the service factors given.

Table II—Service Factors for General-purpose 40C. Induction Motors

Hp.	Service Factor
1/20	1.4
1/12	1.4
1/8	1.4
1/6	1.35
1/4	1.35
1/3	1.35
1/2	1.25
3/4	1.25
1 at 3600 rpm. only	1.25

Table III—Starting Current Limit

Rated Hp.	Locked Rotor* Current, Amp. 115 Volts	230 Volts
1/6 and smaller	20	10
1/4	23	11.5
1/3	31	15.5
1/2	45	22.5
3/4	61	30.5

Starting-current limits correspond with the maximum locked-rotor currents given in Table III. The standard provides that the locked-rotor current of 60-cycle, single-phase motors (900-3600 rpm.) of any type, except those split-phase motors at present used on washing machines and ironers, shall not exceed the listed values.

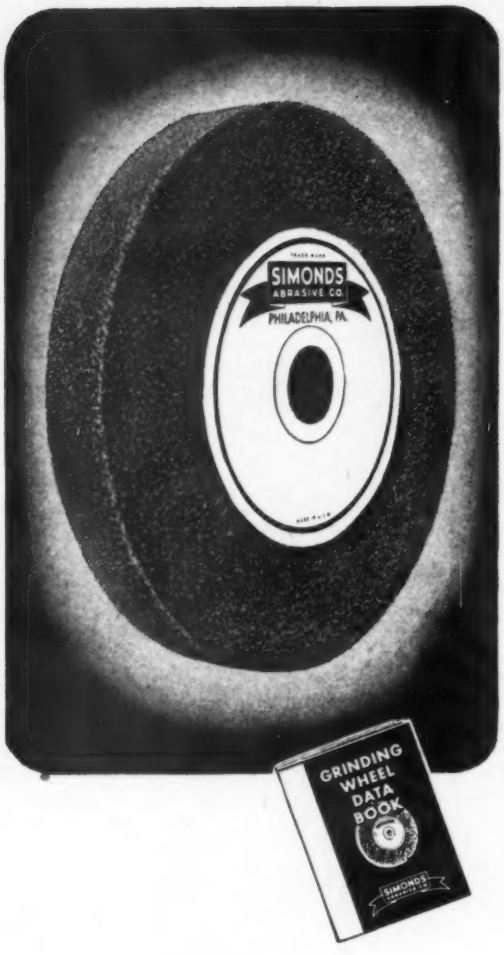
The NEMA standard lists code letters, Table IV, to designate the starting current in terms of "locked kva. per horsepower."

Table IV—Code Designation of Starting Current

Code Letter	Kva. per Hp.*
A	0- 3.15
B	3.15- 3.55
C	3.55- 4.0
D	4.0- 4.5
E	4.5- 5.0
F	5.0- 5.6
G	5.6- 6.3
H	6.3- 7.1
J	7.1- 8.0
K	8.0- 9.0
L	9.0-10.0
M	10.0-11.2
N	11.2-12.5
P	12.5-14.0
R	14.0-and up

**Locked kva. per hp. includes the lower figure, up to but not including the higher figure.*

Rule O' Thumb



may get you

half a wheel

Why wear down and out two or three wheels when one might do the job and do it better? Selecting wheels by guess adds up to too much money for too many wheels; too much cost because of sluggish stock removal, inaccuracies in finishing, and rejected work.

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NEWS OF METALWORKING

West Coast Plants Blame Plight On Eastern Suppliers and Labor

SAN FRANCISCO — Metalworking shops here, much to their displeasure, are realizing more than ever their dependence on the East. Although shortages are plaguing the national manufacturing picture, westerners are inclined to feel discriminated against. Many claim eastern suppliers are favoring markets closer to home. They feel this area's outstanding wartime population and industrial growth should be considered in delivery of hard-to-get material, rather than basing it on prewar quotas.

Effect of this is going to be all-out support for strictly western enterprise. Company officials will back anybody who will help bring about complete industrial independence for West Coast manufacturers. Never again do they want to see the depleted or non-existing inventories that are curtailing production while backlogs build up.

Endless List of Shortages

Metalworking plants are faced with an endless list of shortages of raw materials and component parts. Electric motors are an example of a component shortage holding up completion of metalworking shop products. No fractional horsepower variety are manufactured in the West and only small dribbles, if any, are arriving from the East.

Executives don't expect decontrol to affect immediately their unfavorable situation, because eastern suppliers still will keep their markets closer to home. Little relief is expected before late spring or early summer.

The labor situation is cause for concern. Machinists of all kinds are hard to find. This is especially true of toolmakers and set-up men. Plant operators are unhappy about the present handling of trainees and apprentices and definitely are worried about the labor that will be needed when materials will let production roll unhampered.

Machine Tools a Problem

When the material supply cloud passes, new machine tools and parts to keep old ones in repair will be a problem. Of an estimated $44 million worth of government-owned machine tools in northern California at the end of the war, about $15 million worth have been sold and a like amount has been declared surplus and ready for sale.

To sum up the position of metalworking shops in the San Francisco Bay area—it can be said to be good and bad. Good as far as orders on the books go, but bad until material, labor and equipment stabilize to allow peak production.

Slash in Jap Steel Production, Machine Tools Sought By U. S.

WASHINGTON—The United States is pushing for reduction of Japan's heavy industrial capacity to a level built around 1,500,000 tons of steel ingot annually, the McGraw-Hill Washington News Bureau has learned from unimpeachable sources. This means stripping Japan of basic steel plant capable of producing 9½ million tons of ingot yearly as well as eliminating huge quantities of other industrial plant which would become virtually useless without steel.

The U. S. position on how much steel capacity to leave in Japan became known coincidentally with the State Department release of a summary of recommendations for "Jap level of industry," made to President Truman last April by American Reparations Commissioner Pauley.

Pauley is reported to have proposed that postwar Japan be denied all right to have industrial capacity to produce arms, ammunition and implements of war, and all plants making synthetic rubber, aluminum and magnesium.

The report further recommends "substantial removals" of facilities in these categories: electric power, iron and steel, iron ore and ferro-alloy minerals, copper, machine tools, chemicals, heavy electrical machinery, railroad equipment and rolling stock, shipbuilding and merchant shipping.

Under the U. S. program, excess Jap industry "released" by limiting steel capacity would become available for transfer to other Asiatic nations as credits against their reparations bill. The U. S. is not interested in claiming any Jap industry direct as reparations for removal to this country. The American program does contemplate insistence upon substantial removals to the Philippines, Korea and China.

The U. S. program will probably be placed before the 11-nation Far Eastern Advisory Commission sometime next month. Japanese reparations have been stymied by Russia's refusal to agree that equipment already taken from Manchuria can be charged to the Russian reparations account. The U. S. now apparently is prepared to proceed on reparation settlements without prior or concurrent settlement of the Manchurian matter.

By relinquishing the bulk of reparations, America hopes to have controlling voice in the assignment of various plants from former Axis nations as reparations.

Wingless Glider — For landing in areas no more than 60 ft. in dia., the Gyro-Glider has been developed by General Electric. It works like a powerless autogyro, weighs 120 lbs., and can lift an additional 300 lbs. Equipped with a tricycle landing gear for limited steering, it can be flown at standard glider heights

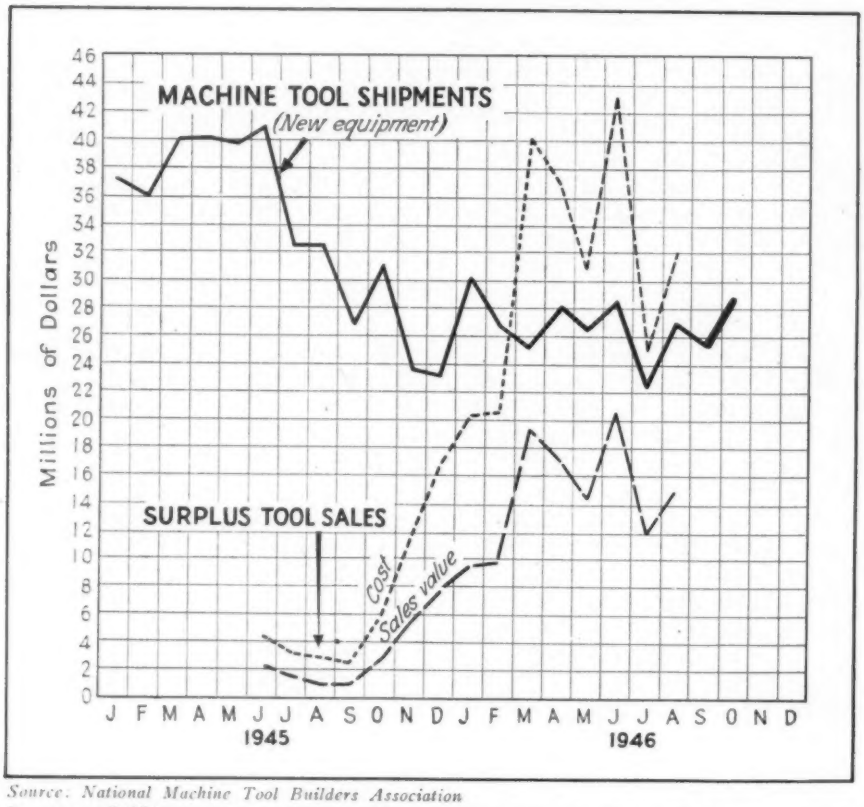
Gaging Business

Shortage Plague Continues

Metalworking plants are gradually showing up production to new postwar heights, but further progress is likely to be blocked until the coal crisis is ended. Price decontrol has made everyone hopeful that shortages caused largely by OPA ceilings will be overcome more quickly than anticipated. But unbalanced production of materials and parts can be put back into proper balance only at moderate speed. The coal stoppage will slow it down. Shortages continue to plague metalworking industries, tightest items being sheet steel, castings and electrical equipment. In the fractional horsepower motor field, makers still are taking more orders than they can fill. Backlog is up to 39,000,000 units, as against 10,000,000 some 13 months ago. There will not be enough motors until the second or third quarter of 1947. Motor producers are having trouble getting gray iron castings, electrical steel sheets, magnet wire and certain other steel items.

Steel Outlook Stymied

The coal strike has cast a pall over the steel industry at a time when substantial improvement was being made in meeting customers' requirements. It is felt in steel circles that if normal production conditions could be maintained, some critical steel situations could be eased considerably by the second quarter of next year. Important new capacity in light cold-rolled sheet steel will be coming in during the early part of '47. This will be a mixed blessing, because it will bring about a drain on supplies of hot-rolled sheets. One big mill, for example, is in the process of withdrawing from mill sales of hot-rolled sheets because all of its output will be needed for its new cold mills, its own barrel plants and its warehouses. Steel is heading, nevertheless, for a normal relationship between different lines of steel products, a relationship upset by OPA pricing. In time this back-to-normal trend will eliminate bottlenecks. Strangely, as hot-rolled sheets become tighter, stainless steel sheets are getting easier. Some deliveries of stainless sheets on fresh orders can be made in January. There are reports that subsidies involving greater quantities of steel for the housing program may be discontinued. If this is done, such action would make possible shipments of larger tonnages to customers outside the housing field.



Source: National Machine Tool Builders Association

Increased Shipments—Reflecting the rise in foreign business during the month of October, total machine tool sales rose to $28,900,000 for the month as against $25,468,000 for the preceding month. New orders were slightly lower than September's while cancellations dropped by 50%. Total foreign shipments netted $7,000,000 worth of business during October

Industry Shipments Improve

Machine tool shipments in October rose to $28,900,000 from $25,468,000 during September. New orders booked by 182 companies representing 92% of the industry amounted to $22,592,000, a slight drop from the previous month's level. Cancellations were only half those in September. Unfilled orders total $175,500,000. Export business has turned upward, shipments abroad during October having been about $7,000,000. Resumption of production by several builders formerly on strike and improvement in the supply of component parts are largely responsible for the pick-up in industry shipments. Motors still are very hard to get, but bearings, castings and steel are available in larger quantities. Indications are that current machine tool backlog will be further reduced to about a four-months' level. Should that happen, cancellations, now running 9% of new orders, will be cut substantially.

Surplus machine tool sales have progressively provided increased competition for makers of standard machines as the year wore on. The situation is now aggravated by WAA's policy of offering hard-to-sell types of machines at about 25% of the original cost. Nevertheless some dealers report that new machine tool orders the past 30 days have been the best of the year, several large buyers having cleaned up tooling programs long under way. Builders are looking to the automotive industry for sizeable orders the next few months in connection with production of 1948 models, which will begin late next summer.

Swollen Order Books

Materials handling equipment makers state that their business is very good. They have comfortable backlogs to carry them along for many months. Heat-treating furnace manufacturers say their sales and production are holding at a high level. Mechanical and hydraulic press companies have swollen order books and are busy turning out huge presses for automobile firms. Can-making machinery builders are fully engaged. Contract tool and die shops are in a position to take considerably more work, though many of them report they are at present operating on full schedules.

Chicago Firms Move Cautiously In Purchasing New Equipment

CHICAGO—Until the price situation is clarified, Chicago area metalworking firms appear hesitant to buy production equipment, and expect in turn to see their customers holding back in anticipation of lower prices.

While a greater supply of raw materials coming into the market following decontrol is hailed as an aid to lagging production, manufacturers are proceeding cautiously. One executive put it this way: prospective purchasers of "big ticket" items are waiting to be certain they are buying at competitive prices rather than at prices set under artificial conditions.

Chicago producers believe that after a brief flurry of high prices, the general price level will settle down, early next year, to a point slightly above the recent ceiling figures. To bolster this argument, manufacturers point to the price trend followed by petroleum products and farm commodities that were decontrolled earlier. In most cases, these items have settled to a plateau moderately above the old ceilings.

Increased Supplies Seen

Meanwhile manufacturers indicate price hikes in essential raw materials —including copper, lead and zinc— may increase supplies to the point that output of finished goods can be pushed past the best postwar levels. Ultimately, they say, this will lead to lower prices for finished products.

C. S. Davis, president of Borg-Warner, points out the higher raw material prices may prove to be cheap when substantially increased production results.

The immediate result of decontrol has been a speedy jump in prices of consumer durable items such as washing machines, heating plants, and stoves. Producers of more expensive items—farm machinery, for example—are moving more slowly in adjusting prices upward.

2,300 Attend IMS Clinic On Time and Motion Study

CHICAGO—More than 2,300 production executives, industrial engineers, business leaders, educators, and time and motion study supervisors attended the 10th annual time and motion study clinic held Nov. 7-8 and sponsored by the Industrial Management Society.

G. Z. Wollam, headquarters director of wage incentives, Westinghouse Electric Corp., said incentive administration is full of serious errors and misunderstandings. He urged clearer statements of management policies, better trained and adequately informed supervisors, and a more tolerant attitude on the part of some employees.

Wally E. George, account manager, Booz, Allen & Hamilton, pointed out ways of extending wage-incentive plans to cover jobs which cannot be measured accurately.

Warner & Swasey Discontinues Rebuilding Tools at Fixed Rate

CLEVELAND—Warner and Swasey Company, machine tool builders here, have discontinued reconditioning and rebuilding tools, they originally manufactured, on a fixed-price basis. Two years of experience in this type of work has convinced company officials that it cannot be done with satisfactory profit under present-day conditions.

Two factors argue against the scheme now, one is the inability to secure component parts and the other involves low productivity of workmen engaged in this type of work.

Rebuilding cost of a tool often brings it close to the cost of a new machine. The owner is dissatisfied and the rebuilder often gets a minimum profit or takes a loss. While such work proved profitable in slack times prior to 1939, Warner and Swasey officials find there is no place in their shops for such a program now.

Not having been a customer for tools made by it and now in WAA hands, company officials profess no interest in such surplus. The company will continue, however, to rebuild machines of its own construction on a cost plus basis, but even that plan has undesirable features.

WAA Action Brings Grumbling

CLEVELAND—Recent price reduction by WAA on machine tools, held by that agency in long supply, has given rise to considerable grumbling on the part of a number of dealers in the Cleveland area with some of the fringe operators stating openly they are ready to turn to more lucrative fields and let WAA do its own work in digging up customers.

First cry by these dealers was the depth of the WAA slash in the price of the listed tools. Another complaint comes from what some term utter confusion in the list of tools now offered in surplus. While all tools listed are said to be in abundance, these dealers claim that many hard-to-get machine tools which have been listed in surplus turn out to be a myth when WAA officials are questioned as to their whereabouts.

Meanwhile there have been some large sales made to larger users of machine tools. Some manufacturers have acquired sizeable lots of WAA surplus tools strictly because of bargain prices, and plan to use the tools in stepping up their production.

One or two well established dealers have turned their backs on the entire program.

Fixed Prices Stimulate Sale Of Hard-to-Sell Surplus Tools

WASHINGTON — The "fixed-price" policy on hard-to-sell surplus machine tools, instituted by War Assets Administration, has greatly stimulated sales, according to WAA officials. At Detroit sales volume has tripled, with 973 machines sold for $1,083,619, or 27.2% of original cost. At Boston 514 units were disposed of for $588,000, or 22.3%. In Cleveland 261 pieces were sold for $322,140, or 19.2%, and in Kansas City 501 units brought 29.7%. Actual reduction from Clayton formula is averaging about 15%.

Machines still in plants of war contractors will have to be sold to lessees at the cut prices. WAA feels that this "windfall" could not be avoided and is sure that contractors will quickly grab machines in the hard-to-sell category at the new prices. Government is not losing money by selling under the Clayton formula, say WAA officials, because the reduction in sales revenue will be more than offset by the warehousing expense that otherwise would have been entailed.

WAA does not blame machine tool industry for objecting to cut-price sale of surplus machines, but thinks that industry leaders are wrong in assailing WAA, which is instructed by law to dispose of surpluses at prices at which they will move. WAA officials suggest that machine tool builders go to Congress and ask for special consideration, stressing that machine tool industry is the basis for production in a national emergency and steps should be taken to keep surplus policy from harming the industry.

Production Equipment and Methods Highlight Exhibits at Metal Show

ATLANTIC CITY — With mild weather inviting visitors to the boardwalk and 79 technical sessions attracting crowds to nearby hotels, the 15,000 people attending the National Metal Congress still found time to tour the exhibits at the Exposition held in the Municipal Auditorium here.

Held concurrently were meetings of the American Society for Metals, American Welding Society, Iron and Steel and Metals Divisions of the American Institute of Mining and Metallurgical Engineers, and the American Industrial Radium and X-Ray Society.

Although attendance was light for an exposition of this size, which was attributed to the fact that a Metal Show had already been held this year and to the distance from many industrial centers, exhibitors generally indicated they were pleased with the quality of the attendance and the interest shown in the displays.

Metal Is Cut with Arc

Production was emphasized throughout the booths with machines and equipment more in evidence than materials. Members of the Resistance Welders Manufacturers Assn. had a number of exhibits grouped together on the lower level. New machines were shown by Federal Machine and Welder Co.; Sciaky Bros., Inc.; Progressive Welder Co.; and Taylor-Winfield Corp. Federal exhibited, among other machines, a new bench-type, air-operated 30 kva. spot welder and a special-purpose, single-phase, capacitor-discharge spot welder for steel and aluminum. Sciaky also showed a steel and aluminum combination welder. Progressive introduced a storage-battery, aluminum flash welder that draws from 35,000 to 50,000 amp. from 8-volt batteries recharged automatically at 18 kva. and a 30-gun cam-drum controlled multiple spot welder. Taylor-Winfield showed its new bench, type SB, air-operated and ENB type 1 press welders.

Arcos Corp. introduced the Oxycuttend rods and holder in its Oxyarc Process for cutting stainless and other metals. The rod is dragged along the line of cut in contact with the work. Oxygen is supplied through the coated tubular rod and the arc is established between rod and metal to be cut.

National Cylinder Gas Co., Hollup Div., exhibited its Shield-O-Matic electrode for automatic welding. The fin-ridged electrode core is wound with two helical coiled wires and is coated between the wires with flux, giving the core a continuous, seamless-tube coating of flux.

Wall Colmonoy Corp. demonstrated its new Spraywelder for applying powdered Colomony hard-facing alloys. The overlay is then fused by heat into a hard, dense layer showing no porosity in deposits up to 0.060-in. thickness.

Here's An Example says A. B. Einig, general manager of Motch & Merryweather as E. J. Kossuth sales manager of the saw division holds a sample for inspection by C. M. Doering (right) industrial engineer, Thompson Products

Puffing A Cigar, E. Von Hambach, Carpenter Steel expert, gives some advice

The Powder Weld Co. demonstrated its unit for welding, brazing and surfacing with composition of finely divided or powdered metals mixed with fluxes. The mixture is projected through the flame cone onto the work surfaces.

Air Reduction Sales Co. demonstrated its stainless steel cutting equipment, a No. 40 Radiagraph with a water-cooled cutting torch. Lincoln Electric Co. showed its new air-cooled, engine-drive welders and demonstrated the Lincolnweld process.

Among the new type welding rods and electrodes exhibited were lime-ferritic rods by Metals & Thermit Corp.; rods for stainless steel by General Electric Co. and Eutectic Welding Co.; and Easy-Flo 35 and 45 brazing alloys which have reduced silver contents, by Handy & Harman.

New Steels Are Shown

Samples of Desegatized steel were shown by Latrobe Electric Steel Co. Carbide segregation in the core is virtually eliminated by control of the melting and forging cycles. The steel receives no heat-treatment except in the forging cycle.

An air-hardening die steel, Vega, was exhibited by Carpenter Steel Co. Vega will harden entirely through in sections up to and including 8-in. dia. by cooling in a free circulation of air.

A self-vitrifying, high-temperature furnace coating was shown by Johnson Fuller Co. Vitrobond forms a crystalline, semi-glazed surface which unites with the brick and will stand 3850 F.

Several plastic coatings which can be applied by brush, spray or dip were displayed. Seal-Peel and Plastic Seal are used as a protective coating for shipping or storing. They are made by Seal-Peel, Inc., and Progressive Systems, Inc. Liquid Envelope, made by Better Finishes & Coatings, Inc., is a thin material applied during processing. Work can be formed or drawn as much as 7

in. without rupturing the coating, which prevents die marks on the work and will protect it from scratches or weld spatter in subsequent operations.

Inspection by Sound Waves

A variety of new inspection and measuring devices were shown in which accuracy to four or five decimal places was almost commonplace. Physicists Research Co. demonstrated a new tracer for the Profilometer which requires no adjustment. Two hardened steel balls support the head in which the diamond tracer is mounted.

General Electric X-Ray Corp. introduced an Ultrasonic Material Tester which reveals internal defects too fine to be shown by X-ray. Sound waves are transmitted under water through the material and any flaw in the material will affect the signal that is picked up and register on a meter. This company also demonstrated a pneumatic fatigue machine which conducts fatigue tests at the resonant frequency of the specimen up to 12,000 cycles a min.

The Sheffield Corporation had in operation the new Measuray which uses X-rays to check the thickness of moving material without contact with the work. The X-ray signal that passes through the work is compared with a signal passed through a standard sample and the difference registers as a percentage variation from the standard.

The new Tukon tester exhibited by Wilson Mechanical Instrument Co., Inc., is used to determine Knoop and 136° Diamond Pyramid hardness numbers. Indentations may be as small as 20 microns and accuracy to at least 1 micron is possible.

The Gaertner large toolmakers microscope was shown by George Scherr Co. This microscope has a heavy stage with a measuring range 8 x 4 in. Also shown in this display were the new Parkson gear tester for spur, spiral, bevel and worm gears. Center distance may vary from 1½ to 9 in. with dial indicator readings to 0.0005 in, possible.

Salt Bath Demonstrated

Modern equipment and processes for heat-treating constituted a strong feature of the Exhibition. Successful control of distortion by the interrupted-quench, as in the martempering and austempering processes, was demonstrated by Lindberg, Ajax, Holden and Houghton. Houghton exhibited the effects of plunging knife blades in oil, water and salt at 400 F. From the first two the blades were withdrawn with wavy edges, but when removed from the salt the blades were still straight and flat and were free of quench cracks.

Posing in front of their torch-cutting exhibit are (l. to r.) J. E. Norcross, D. C. Mockus and R. D. Thomas of the Arcos Corporation

The Holden marquenching furnace features forced circulation and air cooling of salt, to maintain uniform bath temperatures. These principles allow the equipment to be smaller for the same load.

A process for hardening stainless steel without changing the part dimensions, while increasing resistance to corrosion, spalling and softening at temperatures up to 1000 F., was revealed by C. U. Scott & Son.

For heating bars and slugs for forging, Ohio Crankshaft showed a working model of a conveyor-type induction heating machine to heat bar ends at a high production rate. Selas Corp. had a rotary slug heater that handles 1-in. dia. by 1-in. long pieces at 6000 per hr.

Surface Combustion talked about "suspended carburization," whereby a production furnace and its contents are held at heat over the weekend, but reactions in furnaces are suspended until resumption of work.

E. F. Houghton & Co. displayed 17 cleaners for metals and industrial housekeeping, the materials being based on new developments in wetting agents and detergents. Mention was made of adding a fluorescent material to cleaning baths, exposing cleaned articles to ultraviolet control measure.

Among the machines and tools displayed were the new welded-steel presses and press brakes built by Warren City Mfg. Co. 75- and 100-ton OBI presses were shown. The 75-ton press displayed had a 5-in. stroke although strokes up to 8 in. are available. The press has 45 strokes per min. The presses operate on the shop air line with 60 to 80 psi. desirable. The press frames are carefully stress relieved.

The method of operation of an end loading—end unloading, star return, wet cleaning mill was clearly shown in an operating lucite model displayed by Ransohoff, Inc.

Tocco Heatgun is demonstrated by Dr. H. B. Osborn sales manager of the Ohio Crankshaft Co., to G. C. Riegel chief metallurgist of the Caterpillar Tractor Company, at the National Metal Congress and Exposition

Prewar Labor Productivity Level Is Near at Hand in Chicago Area

CHICAGO—Increased labor productivity in the Chicago region offers an encouraging sign to metalworking concerns. The consensus is that productivity is approaching prewar levels. Wilfred Sykes, president of Inland Steel, said efficiency of the company's employees is about at the prewar point. He attributed the gain to the company's high operating rate, close to 100% of capacity.

Western Electric also reports that productivity of the firm's 35,000 workers is close to prewar. The company is operating on a six-day, 48-hr. week, with several departments on a two- or three-shift basis. Signode Steel Strapping Co. said that man-hour output is equal to wartime levels and is above prewar.

New Machinery Helps

Independent Pneumatic Tool Co. attributes increased productivity to new machinery. Edison General Electric Appliance Co. says that output per man-hour has climbed in the last few months, but has not reached prewar levels because component part shortages have impeded production.

Edison, with output now equal to prewar rates, expects to increase production 250 to 300% next year and in 1948. With a $17 million expansion program underway, augmented production facilities are expected to be completed next year and in 1948. The company's three major lines—electric ranges, water heaters and dishwashers—are made in Chicago, and plant expansion is expected to double the company's employment.

Ingersoll Steel Division of Borg-Warner is turning out its prefabricated household utility unit at the rate of 25 a day, and output is expected to jump in 1947. The unit, which includes all of the necessary components for a kitchen, bathroom, space heating and water heating, has received unexpectedly cordial treatment by the building trades unions. If production of the unit moves ahead according to plan, volume will hit $30 to $40 million next year, according to Ingersoll officials.

MACHINE MAKES SHEET STEEL FROM BOMB SHELL CASINGS

CHICAGO—A Chicago firm, the H. & L. Manufacturing Co., has hit upon a unique way to beat the sheet-steel shortage. The company is buying incendiary bomb shell casings sold as junk by the Government, and is using a specially designed machine to cut and flatten the casings. They are turned out by the device at the rate of 400 per hr. in the form of flat-rolled sheets, 9 x 17 in. and 19-gage thickness. The sheets are sold for a variety of purposes, including a number of metal toys. Starting with a stock of 475,000 casings, 280,000 have already been processed.

Repeal of Wagner Act Demanded In Resolution Adopted By NMTA

NEW YORK—The National Metal Trades Association is on record as demanding repeal of the Wagner Act. More than 600 members representing 1,200 plants unanimously approved a resolution at the recent convention here urging repeal of the National Labor Relations Act.

Association members supported the following points: (1) The right of every worker to deal with his employer by collective bargaining through any agency he chooses; (2) The right of every individual to work, or not, as he chooses; (3) The right of every individual to deal with his employer directly as an individual, if he chooses; (4) The right of every individual to go to and from his work unmolested; (5) Equality under the law and protection of minority rights; (6) Monopolistic activities of all groups, whether employer or employee, must be controlled in the public interest.

David R. Clarke, general counsel for the association, warned of an impending wave of legal actions for recovery of wages for uncompensated time during a summary of travel time pay trends. He stressed the fact that under the Wage and Hours law, an employee who has not been paid for time which should draw compensation can sue his employer for double wages, plus his attorney's fees.

Howard Goodman, vice president of the Goodman Manufacturing Co., Chicago, was elected president, succeeding H. H. Kerr, president of the Boston Gear Works, North Quincy, Mass. T. J. Morton, Jr., president of Hoosier Cardinal Corporation, was named first vice president, and Joseph L. Kopf, president, Jabez Burns & Sons, Inc., was made second vice president and treasurer.

Steel Market Continues Stable Except for Scattered Price Hikes

PITTSBURGH—Scattered price advances have appeared in the steel market since decontrol by the Government but a remarkable stability of quotations backed by an opinion of the leading producers that "this is not the time to act" has developed in the nation's leading industry.

At this writing, greater attention is being paid to problems of operations as a result of diminished coal supply prospects rather than to prices. It is recognized, however, that should the United Mine Workers obtain higher pay, the resultant increased costs in manufacturing steel will cause higher prices.

Galvanized Sheets Go Up

Several small companies have already raised the price of galvanized sheets and at the same time figured quotations on a new base which resulted in price revisions relating to gage and coating. One guess in industry circles was that the advance in galvanized sheets averaged $7 a ton. A few small plate makers increased the price of plain plates to $5 a ton.

The industry impression is that the increase in galvanized sheets probably will become general within a short time inasmuch as the hike is based on higher prices of zinc since the last change in the quotation of galvanized sheets. Thus far, no similar action has developed for other coated-steel products.

There is a report of one consumer buying certain sizes of plates at warehouse prices and making arrangements with a sheet mill to convert this steel into sheets. Need here is evidently of such importance as to outweigh all factors of cost.

Wire Orders Heavy

A better balance in wire mill output is being expected in some quarters as a result of price decontrol. Demand remains heavy. Merchant pipe is booked for a year ahead and line pipe for nearly two years, based on orders and protections.

Tin plate prices, which may be boosted the amount of the increase in tin, are expected to be announced early in December.

Maremont Automotive Products, Inc., is the head of a group which recently acquired the Apollo Steel Company, non-integrated sheet producer, it has been learned.

Detroit Letter

Auto Industry Optimistic

If there is any recession or "bump" in 1947, Detroit does not figure it will feel the jar at all. Barring large-scale strikes, the auto industry believes that even substantially reduced business will still be more than can be accommodated by next year's quotas of materials and production facilities.

Schedules, accordingly, are still being maintained at the fastest rate possible with today's availability of steel and pig iron. There was some thinking expressed in auto companies that they might go out and bid for steel above present price ranges; but this sentiment met scowls of disbelief from the steel community.

Whether or not the feeling grows from unadulterated post-OPA optimism, Detroit believes, it can better its current output rates by next spring. One executive expects increased deliveries of steel during the first quarter, with manufacturing reaction apparent by March or April. This output, of course, will be on the 1947 models due to start into production in some cases as early as the end of this month. After 1947 model runs and the subsequent changeovers are completed, auto experts are pointing toward definitely higher volume in the last 1947 quarter, made possible by sheet and pig iron supplies expected to be nearly ample by then.

Buyers' Market for 1948

Despite this rosy general viewpoint, which would infer that Detroit expects to be the bootstrap lifter if the country's economic activity sags next year, individual companies are looking ahead realistically. While they all expect sustained demand for automobiles (generally figured larger today than it was a year ago, due to failure of output to keep up with scrapping), they are coming around to the viewpoint that by the end of 1947, cars will have to be sold, rather than simply delivered. This will echo the experience in other lines: buyers want goods today, but are more choosy about makes and models and sizes.

Scant tooling for 1947 models is completed now, consisting almost solely of grille changes, intended to distinguish cars made in 1947 from those of 1946. Shutdowns for inventory and changeover will be coming along in the next few weeks, first in the General Motors divisions, then in the independents and Chrysler, with Ford probably last to shift. Practically all companies have decided on surface changes which will enable them to announce 1947 models quietly.

Machine Tool Buying

Little tooling has yet been placed for the 1948 models, which can be expected to embody rather substantial changes. In view of the extensive talk about automatic transmissions, it seems logical to expect considerable buying of machine tools to make parts for these new gearing devices. Ford may also buy equipment to produce coil-spring assemblies; the word is drifting around that transverse springing is bouncing to the end of the road at the Rouge.

Also in the category of facts not known until now is the news that Packard is tooled to make a small line of light trucks. Ranges will be from panel delivery size up to 1½-ton dimensions, all small enough to be serviced in Packard dealer establishments without undue difficulty. But the Packard trucks will not be on the market for some time, to the discomfiture of company officials looking over the current unprecedented demand for commercial vehicles. As long as there is insufficient steel to build passenger cars, the available supply will not be partially diverted into new channels.

Hudson Plans Expansion

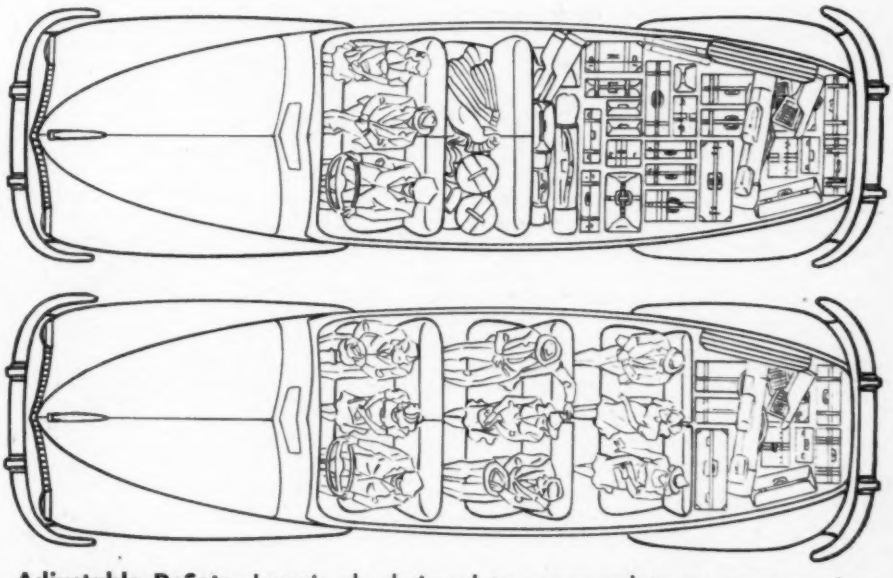
Switching the spotlight to another independent, Hudson Motor Car Co. is understood to have plans afoot for an expansion of some $6,000,000 as soon as the construction skies clear. This would go mainly into new plant facilities, but of course there would be accompanying tooling requirements.

New construction, it should be noted, has become expensive enough to give motor companies, like others, pause for intensive consideration before go-aheads are signaled. Some thinking in the building trades is that costs may go down later, due to the catching up of supplies with demand.

Submerging of OPA has had repercussions in the auto industry already beyond the well-publicized action of G.M. in raising all prices $100 and similar moves by Willys and Crosley on isolated models. Costs are going up at the auto plants.

Constant-Flow Assembly

Moving fixtures and automatic welding machinery will allow future assembly of auto and commercial vehicle bodies in a constant flow, according to L. M. Benkert, sales manager, Progressive Welder Company, before the Society of Body Engineers. The prediction, involving a new concept in sheet-metal fabrication, will not be confined to motor vehicles, but embrace all sheet-metal products.



Adjustable DeSoto—Ingeniously designed to accommodate as many as nine passengers or provide more than six feet of luggage space, the DeSoto Suburban has a 139½-in. wheelbase. The three-position rear seat can be folded down to become part of the floor while the front and center seats are fully adjustable to provide many passenger-luggage combinations. The luggage capacity is augmented by a large rack atop the car

Night Problem—A machine-gun company, in cotton overwhite parkas for camouflage and wind resistance, firing tracer ammunition from water-cooled and air-cooled machine guns, and the Garand rifle. Over cotton-pile jackets and caps, this clothing combination is good down to about 20 F. "Inverted birds" at right are shell bursts

Br-r-r—What a Guy Goes Through In Testing Army Fighting Gear

New and improved weapons, clothes, vehicles and food being tried under winter conditions to prevent any repetition of World War II experiences. Here are typical items, photographed in the field at Camp McCoy

By E. J. Tangerman, Managing Editor

CAMP McCOY, WIS.—"I wish I'd had that!" exclaim World War II veterans when they see recoilless field guns, sleds, tent heaters, foods and winter clothing now under test here. Most of it grew directly from our experiences in the Battle of the Bulge and the Ardennes, but reached the field too late.

To prevent a recurrence of our traditional procedure of arming while our Allies hold the line, then investing men instead of experience in combat, the Army is conducting a series of experiments with the new equipment. Three task forces, each made up of units from every branch of the Ground Forces, will test these devices and suggest necessary alterations to development-board representatives right on the ground. Task Force Frost, here, consists of 1500 men testing under wet-cold and heavy-weather conditions; Task Force Frigid at Fairbanks, Alaska, testing under dry-cold conditions (down to —60 F.); and Williwaw at Adak, Aleutians, is testing under fog and climatic extremes.

Tests will be run in a repeated series as the weather grows worse, comparative data being recorded for later study. Newer items in field use are pictured and described in accompanying pictures and captions.

Track-laying vehicles, including the "Weasel," the 38-ton, 420-hp., high-speed artillery prime mover, the 45-ton M-26 medium-heavy tank and the 30-ton medium M-4 tank, are being tested on three grades, 30, 45 and 60%, bulldozed out of a hillside. In first tests, the "Weasel" alone made all grades; others were so heavy they dug into the sand.

Many of the newer materials are in use, plywood for packboards and sleds, plastics for small parts and to replace stainless in the familiar mess tray, nylon in tentage, mountain-climbing rope and various wrappings, synthetic rubber for special applications.

Radio locators replace the theodolite for tracking meteorological balloons, and the balloons themselves carry miniature radio sets as high as 90,000 ft., the sets broadcasting back to a radiosonde unit (in a trailer) the humidity, temperature and height, thus enabling far-more accurate artillery fire. Balloons may be tracked also by radar units, which are also being used for tracing artillery shells and for locating enemy guns much more quickly than it can be done by sound-ranging, which has been much improved.

We have picked up many good ideas from both our Allies and our enemies. Typical are the tracking instrument adopted from the British and the eating set adopted from the Germans. We are experimenting with hydrogen-peroxide engines (which the Germans used to propel high-speed submarines under water) and boilers (as in the V-2). We are also developing many ideas of our own. Recoilless weapons, the automatic rifle and hydraulic or electrical turret operation are among the the latter. We are testing the British Byrnje vest (a loose, coarse net undervest), improving the high-ve-

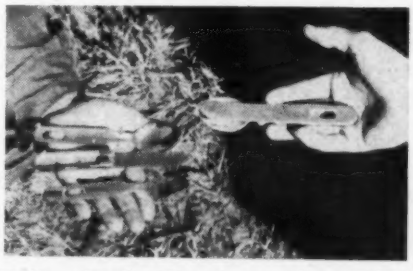
Heat Maker—To heat two large hospital tents, this 250,000-Btu.-per-hr. heater burns gasoline fed through a fuel-injection nozzle to a pressure burner, and incorporates a blower to force heated air through two collapsible 12-in. canvas tubes, each of which can feed three 6-in. dia. canvas tubes

All photos but those of the tent heater and eating tools courtesy Signal Corps, U. S. Army.

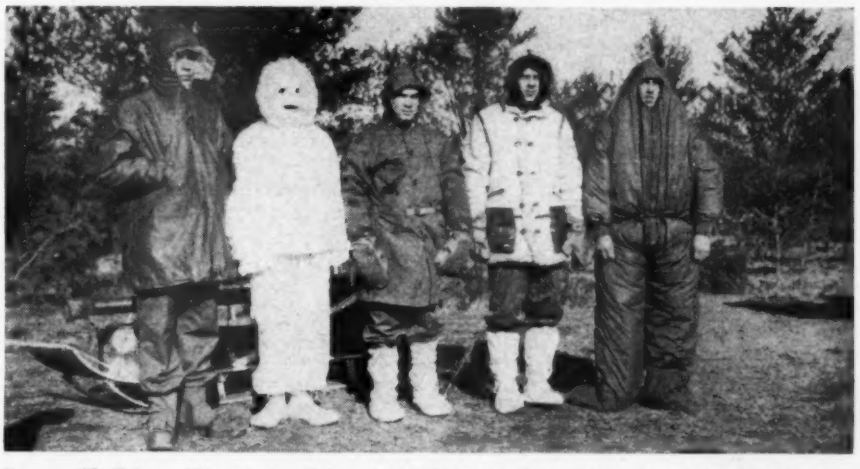
Heavy Stuff—One of the biggest self-propelled guns is the 8-in. howitzer, which can move into position at 20 mph., drop its tail spade and start to fire in about 1 min. It throws a heavy shell about 10 miles

locity gun (German) and the gyro-stabilizer. Among other things we have an illuminating shell fired from the 155-mm. howitzer which will illuminate a 1000-yard circle for a minute so it can be fired upon from 2000 yards away. It is a magnesium flare suspended by parachute.

One of the most spectacular items under test is the demolition snake. This is formed of aluminum-alloy W-bars, put face to face so they form a figure 8 and bolted together along the center. By overlapping sections, flexibility can be varied as desired, and the unit can be built up to 400 ft. long. Its main purpose is to open lanes through mine fields. It is assembled, towed to the vicinity of the field, then pushed through the field by a tank. Its lethal quality is provided by metal-encased cartridges of Amatol in the loops of the 8, arranged to fire when the pear-shaped nose of the snake is hit by machine-gun bullets from the tank. With 14 lb. of explosive per linear foot for 320 ft., the unit can open a 20-ft. lane for tanks and troops.



Eating Tools—Our troops in combat found the standard knife, fork and spoon noisy and cumbersome. We've adapted a German idea into a nested stainless-steel kit, the handles of fork and spoon sliding under lugs in the knife handle to make a compact unit



Layer Clothing—The Army has adopted the layer principle of insulating the body. Some 14 different clothing combinations are being tested, resulting in an investment of $1200 per man for this item alone. Here are five combinations

Alloy Combinations Stressed At Recent Metal Show Meetings

ATLANTIC CITY—The properties of a steel may differ significantly depending upon whether the alloying elements are in the metallic iron or in the carbide, said Dr. J. B. Austin, Director of Research, United States Steel Corporation, in the annual Campbell Memorial Lecture at the meeting of the American Society for Metals. Each year an outstanding scientist is selected to deliver the address to honor the late Prof. Edward deMille Campbell of the University of Michigan.

Dr. Austin said that the hardness of the carbide and its resistance to etching depends on how much alloying element it contains. Manganese, chromium, molybdenum or tungsten may replace the iron in the carbide. Thermal expansion, electrical resistivity, magnetic quality and corrosion resistance may be influenced not only by the amount of the alloying elements but by their distribution in the metallic iron and carbide.

Dr. William Hume-Rothery, professor of physics at Oxford University, predicted that in the future alloys may be worked out on paper by equilibrium diagrams of combinations which were made possible by atomic research. Dr. Hume-Rothery delivered the 1946 Annual Lecture at the meetings of the Iron and Steel and Metals Divisions of the American Institute of Mining and Metallurgical Engineers. An overflow audience heard Dr. Hume-Rothery assert that metals should be ten times as strong as they are. He said scientists are trying to understand the reasons for structural weakness through study of the arrangement of the atoms in the solid metal, seeking to establish how the various arrangements affect the properties of alloys.

Germany was helped to meet requirements for steel during the war by a large production of vanadium from pig iron smelted from iron ores containing about 0.1% vanadium, R. P. Fischer of the U. S. Geological Survey told the AIME meeting. The pig iron was blown in converters to yield vanadium-rich slag, from which vanadium was recovered by chemical treatment.

An enlarged resistance welding setup for producing railroad cars in quantity was described by A. M. Unger, Pullman-Standard Car Mfg. Co., at the annual meeting of the American Welding Society. He said roofs and sides for the cars are being made in large spotwelding fixtures that handle full-sized car length sections. These fixtures insure correct alignment and minimum distortion, also accelerate low-cost production.

Tight Legislative Labor Controls Loom If Labor Forces Showdown

NEW YORK — American industry watched the mounting government-John L. Lewis showdown fight last month with one big question in its mind: Will the end result be tighter controls over labor unions?

Organized labor, particularly CIO's Political Action Committee, received a resounding setback at the polls in congressional elections in November. There was no doubt afterward that the Republican landslide had given advocates of labor law revision sufficient strength to pass their legislative program. For the first time in 14 years, the trend definitely was away from advocacy of labor's cause to equalization of labor and management rights and responsibilities.

Unions recognized this and shifted tactics immediately. From their offensive against "reactionary" congressman—all of those who did not vote labor's way in the last session —the unions, spearheaded by PAC, turned to a defensive program. The announced objective was to revive the cohesive voting power which led to labor's political successes of the Roosevelt years. To do this, labor immediately sought a "cause" to serve as a rallying point for the mass of union members.

Seek to 'Preserve Rights'

That cause was brought forward at the CIO convention. Workers nationally were called on to prepare to fight in every ward and in every precinct to "preserve the rights won by labor and the people during the Roosevelt era."

This is just as important for management—intent on assessing the possible relief to be had from the new Congress on industry's labor ills—as the Lewis coal showdown fight. Both are major factors in determining what is to come in the way of revisions in the National Labor Relations (Wagner) Act, the Fair Labor Standards Act, and other national labor laws.

Labor Bills Posed

Before last returns were posted on labor's major defeat at the polls, advocates of a stern program for limiting union power over the national economy were busy preparing bills for quick consideration in House and Senate. Sen. Joseph Ball announced plans for a campaign to ban closed-shop labor contracts —which require that all employees must take out and maintain union membership as a condition for employment. There were many other proposals: a ban on union-administered welfare funds such as that won by Lewis' United Mine Workers, compulsory arbitration of labor disputes with a ban on striking during cooling-off period, denial of Wagner Act rights to supervisory personnel, a ban on secondary boycotts, to mention only the proposals given widest support.

But unless there is strong provocation from labor—such as by Lewis flaunting government orders, or new mass strikes—it is very unlikely that any tough legislation will come out of the new Congress. The attitude is that labor's voting strength still is potentially important, and, if unified, it might again determine a presidential race.

Antagonism Held Doubtful

Hence, strategy in Washington is expected to be a firm but conciliatory attitude toward labor, unless union militance forces a showdown. Congressional advisors are urging floor leaders and committees to give labor politicians the fewest possible issues which could be built up, by PAC's undeniably excellent propaganda, into a unifying cause for all workers.

Result probably will be a sidetracking until after 1948 of such antagonizing issues as the closed-shop ban, limitations on the right to strike freely, and compulsory arbitration. In this delaying action many industrial leaders will side against proponents of "get tough" measures. Attitude is that what is most needed is not a wave of new laws restricting unions and building up new bureaus for government action in disputes, but the removal or limitation of existing laws under which labor now has a lopsided power.

Wagner Act Softening

It is not improbable that revision of the Wagner Act will be part of this softened program. The goal would be to clarify the status of supervisory employees, and to give management more voice during union organizing campaigns and the right to petition for a collective bargaining election to settle jurisdictional disputes in their establishments. These and other changes were demanded recently by spokesmen for 1,200 plants at the 47th annual convention of the National Metal Trades Assn. in New York.

It also is probable that Congress will act to curb back pay penalties which now exist under the Fair Labor Standards Act. Currently, suits are being threatened against all steel companies under contract with CIO, asking accumulated overtime and an equal amount in liquidated damages under a recent precedent - setting portal - to - portal pay decision in the Mt. Clemens Pottery Co. case.

Limitation on Back Pay

Plans are being advanced to ask Congressional action on a revitalized version of the Gwynne Bill, which would impose a nationwide three-year limitation on employee suits to collect back pay and penalties under any newly established interpretation of the Fair Labor Standards Act. Last year the Gwynne Bill was defeated by a slim margin; hope of employers is that the result will be different in 1947.

But present plans to restrain any hastily-conceived new labor legislative program of broader scope will be unavailing if a new wave of strikes results from demands for new pay boosts. If the lid on labor peace blows off in a big way, the White House will receive a flood of restrictive measures, and already tense relations will be brought under further strain.

The next few weeks should be the tipoff on what to expect.

UMW Defiance is reflected on the faces of John L. Lewis, president, and John J. O'Leary, vice president, as Secretary of Interior Krug tried to get them to avert the crippling walkout of soft coal miners. Lewis drew support from even the CIO big-wigs with whom he parted company

Washington Bulletin

Surplus Resale Warning

Anybody can buy war surplus at old established prices, for resale at any price, with ceilings off. But if they do, WAA Administrator Robert Littlejohn says he will raise his surplus prices to match market levels. There could be flagrant speculation only in hard-to-get items. Nearly everything WAA has is or soon will be in new production by industry.

WAA Considers Schools

Long-supply machine tool items will be included in WAA's expansion of nominal price sales to schools. WAA now sells at 5% of cost, with highest priority to schools operating under the GI Bill of Rights. To all others, in general, there is a discount of 40%. But because non-GI institutions also are jammed and short of equipment, they will get long-supply items at 95% off, at fourth priority.

Bargain Days Ahead

Littlejohn's regional inspection junket by his high officials really amounts to a regional quota sales competition, with all the heat on. Each director has been told to put a certain proportion of his inventory on sale, in accordance with Washington's "master plan" to dispose of three-quarters of total stock by Jan. 31. The Administrator is aiming at quadrupling the September disposal rate of $250 million per month—to a billion per month. He knows it is nearly impossible because (1) desirable goods are getting scarce; (2) new goods are flowing faster. Everybody knows there will be a mountain of stuff left after the drive, and low bidders will get it.

Credit Cards Issued

War Assets is issuing letters of credit to firms wishing to buy surplus on 30-day open accounts; credit cards may be issued to agents of letter holders. Field officers can approve credit up to $50,000; over that amount is checked with Washington. Customer service centers have been set up in New York, Philadelphia, Pittsburgh, Atlanta, Kansas City, Wilmington, and other centers will be established in regional and district headquarters cities. This is part of the big push. Centers will use "salesmanship." With "one stop" at a center, you can find out what all other regions have on tap . . . and you can be prosecuted by Department of Justice, if you're a local government official and you speculate with your priority—it's happening now.

RFC Acts on Loans

Starting Dec. 1, RFC reduced its "blanket participation" loans from a ceiling of $350,000,000 to $100,000, because 90% of loans already made are not more than the new maximum. Banks make these blanket loans with 75% guarantee by RFC. Up to now, about 5,000 banks have made guaranteed loans totaling $340 millions. RFC told AMERICAN MACHINIST that larger loans are still made, outside of the blanket participation category.

Military Appropriations

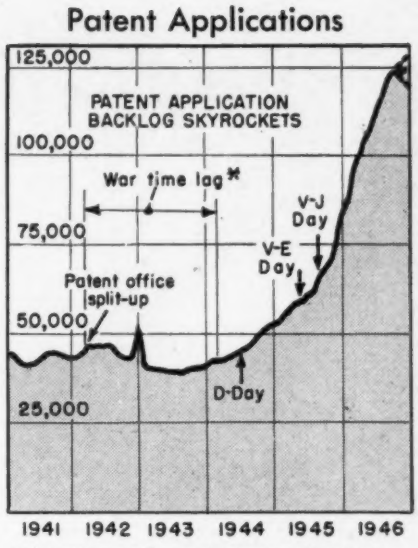
Sharp cutting of military appropriations will not shock the country, politically, nearly so hard as it will hit the Army and Navy. Advocates of the cuts can tell the people they don't need so many "brass hats" and battleships, because they have the atom bomb and guided missiles. If Army and Navy lose their fight for big production of current weapons, they will try all the harder for appropriations to carry on full research and development, without which the rockets and super airplanes to carry the explosives cannot be effective—and they are not effective in range or precision.

Untapped German Data

The Office of Technical Service in Commerce Dept. has issued what it thinks may be a "last call" for American businessmen who want to explore Germany in search of industrial wartime developments which might be adapted to American operations. To date, about 500 Americans have toured Germany under auspices of OTS, but Director Green feels there is still a wealth of untapped data on technical devices and gadgets. While a German Peace treaty might be a long way off, arrangements for such explorations take considerable time.

Freight Rates

Industry generally is watching for Supreme Court action on a series of cases aimed at upsetting an Interstate Commerce Commission order, which is considered a first step toward equalization of freight rates through the nation. The case has two significant aspects: the possibility of permitting decentralization of existing industrial concentration in the northeast, and the possibility that to disregard actual differentials in service costs and conditions, as the disputed order does, may prove detrimental to the stability of the railroads.



Release From War—This chart, prepared by the National Patent Council, shows dramatically how inventors and manufacturers rushed in with patent applications upon their release from military commitments. A record-breaking backlog of nearly 130,000 patents piled up

Ex-Enemy Export Trade

The U. S. Government is fostering return of some Japanese and German items to this country. While present volume is low, it is understood the volume will grow substantially through next year and probably into 1948, unless there is an about face in the U. S. policy and commitments for Germany and Japan. The move is designed to get economies of the two countries back to at least a self-sustaining subsistence level as quickly as possible. The U. S. this year is pouring $200 millions of taxpayers' money into the U. S. zone of Germany alone, in addition to occupation costs, just to keep the people from starving. Statistically, the U. S. has recovered about $7,000,000 of its $200 millions, from exports. The British have done about 11 times better.

Britain Eases Imports

The British Board of Trade has added 38 items to the list of products which may be imported into the United Kingdom in limited quantities under an arrangement between the British and U. S. Governments, according to the Office of International Trade, Dept. of Commerce.

French Design Radical Cars for Economy Reasons

PARIS (McGraw-Hill World News)—War weariness has not impaired the lively imaginations and creative skills of French automobile designers. At the recent auto show, which drew huge crowds, large firms and independent designers exhibited prototypes of radical cars planned for production in 1947. Delivered costs are guessed at in general terms and no doubt will be much higher, but with gasoline at 65 cents or so a gallon, it is evident why there is an all-out drive to cut weight and manufacturing cost. Light metals are used to an incredible extent, compared with American practice. Power plant and drive mechanisms are compacted into packages for rear or front mounting. Body and frame panels are stressed to avoid cumbersome weight. Running-gear details are simplified and made of light metals. Spot welding is much used. Deep drawing is avoided.

Here are some specifications to indicate the future trend:

Renault 4-pass.: 11.8 ft. long; 1140 lb.; 19 hp.; 38 mi. per gal.

Irat 3-pass.: 90-in. wheelbase; 1050 lb.; 40 hp.; 35 mi. per gal.

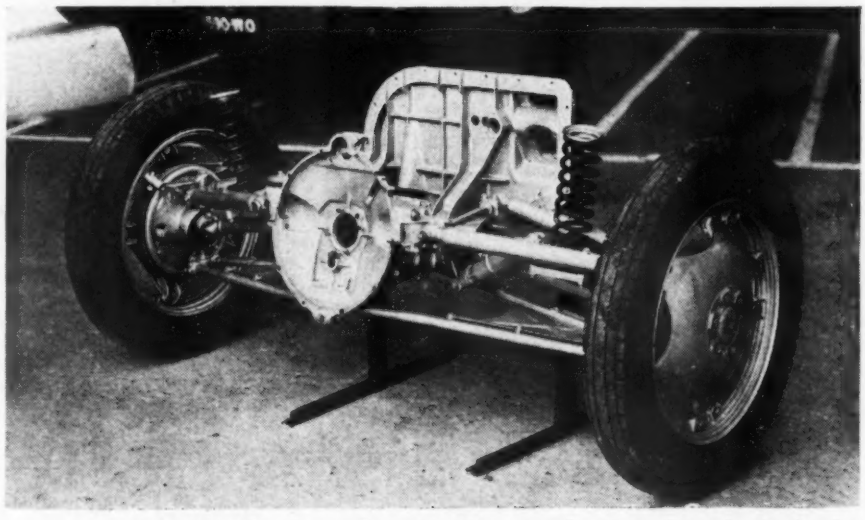
Wimille 3-seat teardrop: 2500 lb.; 60 hp.; 26 mi. per gal.

Claveau 6-pass.: 16.4 ft. overall; 85 hp.; 22 mi. per gal.; approx. $3300.

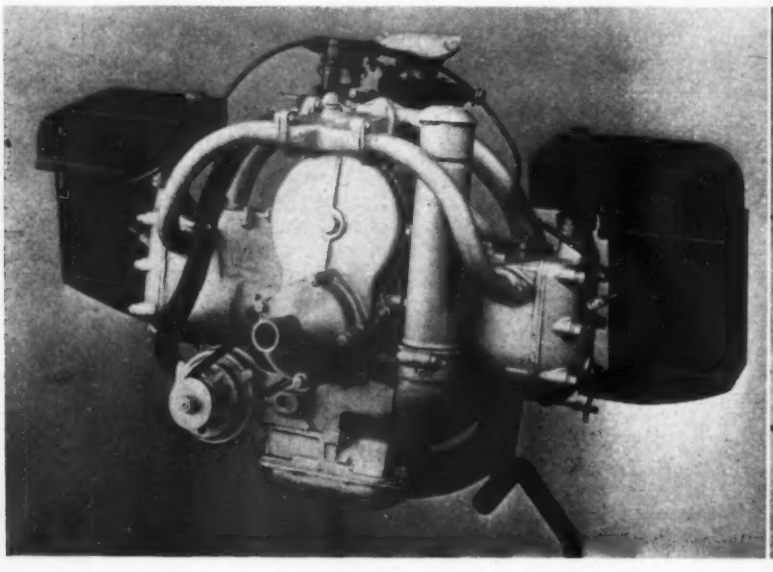
Mathis 3-wheeler: 11 ft. long; 850 lb.; 66 mi. per gal.

Rovin midget: 550 lb.; 6.6 hp.; 60 mi. per gal.; price $550.

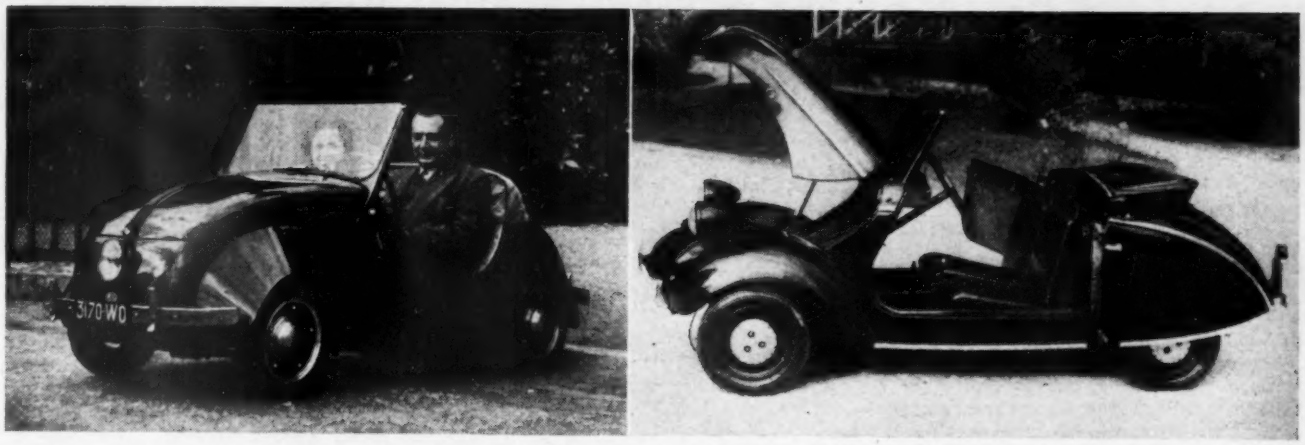
Stressed-Skin Construction—The Mathis body-frame unit, constructed of aluminum-alloy sheets, is assembled with 6000 spot welds, weighs 310 lb.



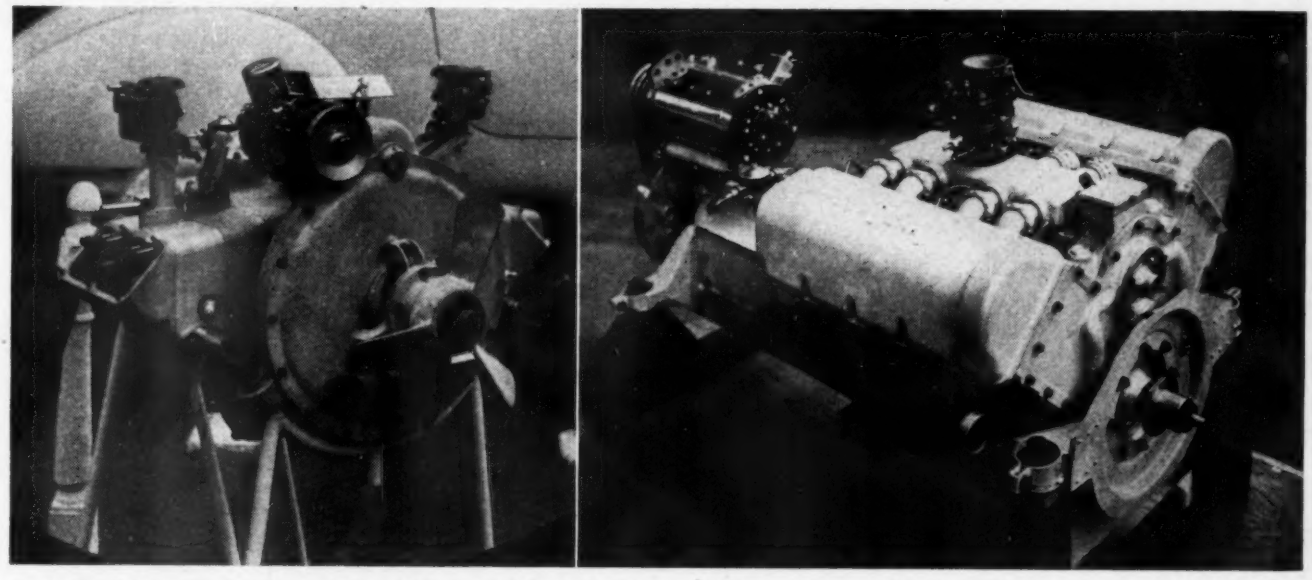
Low Unsprung Weight—Front-drive Mathis uses aluminum for wheels, brake drums, steering column, clutch disk. Assembly is anchored to a heavy plate



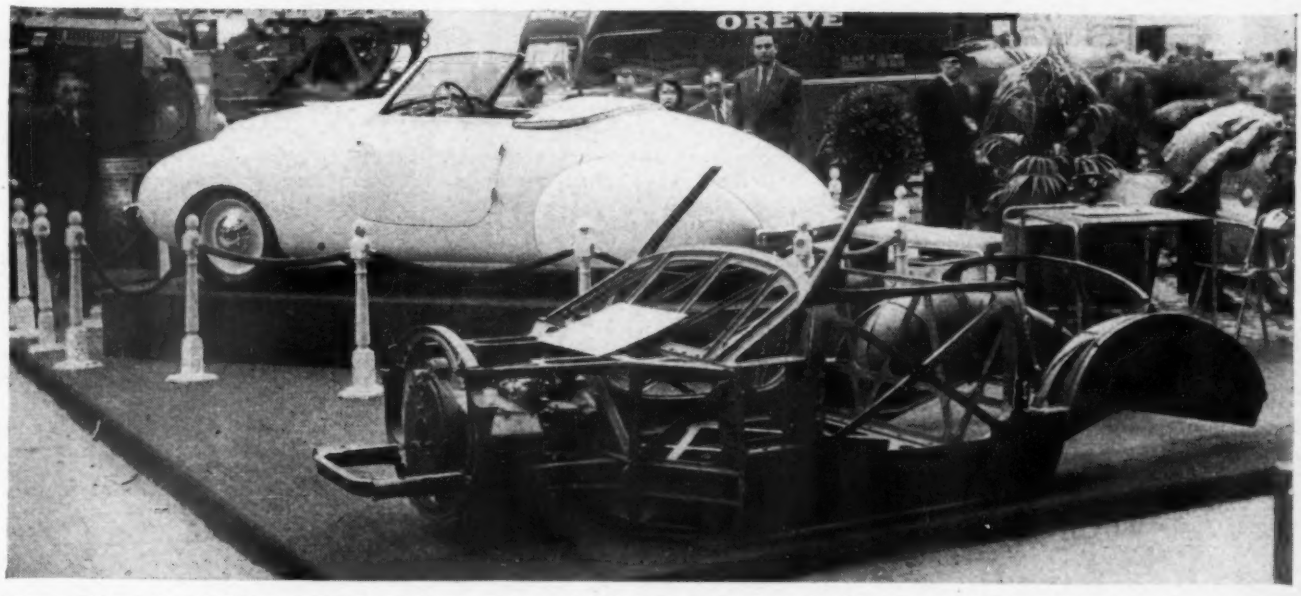
Compact Power Plant—Mathis flat twin engine (below) is combined with clutch, gearbox and differential in aluminum-alloy housing. Special suspension (right) gives the 3-wheel car good roadability



Midgets—Going the whole way toward size reduction, Rovin built this 6.6 hp. car shown (left) with himself at wheel. Julien's one-cylinder runabout has a welded-steel unitized body and frame rigid in torsion and flexure



Light-Weight Power Plants—The 40-hp. Irat (left) has four flat twin cylinders, block and head of aluminum, housing of magnesium. Claveau's 85-hp. V-8 has single aluminum casting for block clutch housing, gearbox and differential



Magnesium for Lightness—Irat's 3-place, 90-in. wheelbase coupe weighs 1050 lb. Inner frame is of cast magnesium trusses bolted together, weighs 220 lb.; outer sheets, aluminum. Front suspension is by single transverse leaf-spring

Foreign Report

BASED UPON REPORTS FROM THE MCGRAW-HILL WORLD NEWS BUREAU

Swedish Underground Factories Found Efficient, Economical

STOCKHOLM, SWEDEN — Efficiency and economy rather than fear account for Swedish factories going underground. Wartime threats of a Nazi invasion launched underground factory operations. Experience convinced industrialists that plants burrowed into granite mountains offer advantages.

While underground factories cost about 15% more to build than plants the same size above ground, long-range savings more than make it up. For example, maintenance costs are slashed—exterior painting, roof repairs, window washing and care of grounds are eliminated. Heating requirements are minimized because of the constant-temperature depths of the rocks. Fire hazards are likewise curtailed.

In one aircraft factory underground, huge rooms hewn out of granite permit crane operations. Air-conditioning equipment controls humidity and temperature, and this same equipment can be used with electric heaters whenever warmth is needed.

Beaverboard is used for walls and ceilings on inexpensive board frame. Parquet floors are of simple construction. Walls and considerable parts of machinery are painted near-white. This, combined with white light, relieves workers of feeling closed-in and tends to eliminate their awareness of walls. A mixture of incandescent and fluorescent lighting is found most practical.

Worker reaction to underground operations has been favorable. Good educational programs have convinced workers that the air is pure, kept at constant temperature, and drafts are eliminated. Some plants have installed artificial windows with painted panorama of outdoor scenes. Engineered lighting has overcome glare and scientific tests prove workers' eyesight is better in cave plants than those above ground. Ultra-violet lamps have been installed in some factories as a health measure.

Outside Interests Opposed

NEW DELHI, INDIA—British engineering firms continue to consolidate themselves within the framework of India's rising industrialization. In this connection, the Indian Merchants Chamber at Bombay has registered a protest with the Department of Industries and Supplies in an effort to halt the inroads of foreign corporations. It will likely be pigeon-holed because of activity in cooperative arrangements.

One of the latest British entries is the Brush Electrical Engineering Co., Ltd., scheduled to supply Kirloskar Electric Co., Ltd., with equipment, designs and technical assistance. Besides its 8% interest in the concern, Brush is to receive 2½% of the net sales, plus the cost of jigs it supplies.

Mysore Machinery Manufacturers, Ltd., has joined the ranks of rapidly growing machinery industries. Planning to be in operation within the next few months, Mysore is eyeing the large market for textile plant equipment and will turn out power looms, dobbies and other weaving equipment. It will also produce machinery and agricultural machinery, malleable iron castings for railway and industrial uses and engage in fabricating and erecting structural steel work.

Meanwhile bitter complaints have been made against government import policies by Standard Batteries, Ltd. It points out its business prospects have slumped as a result of dropping sales controls and easing of import restrictions.

Pleading for Government assistance in the form of tariffs and price controls it asserts that Indian antimony prices have risen 480% over 1938 and now are 370% higher than U. S. prices, and that the lead prices are up 83% to a level 33% higher than those in the U. S.

MACHINE TOOLS FOR CHINA

NEW YORK—Affiliated with the rehabilitation program in China, the American Committee in aid of Chinese Industrial Cooperatives is seeking contributions of out-dated machinery and machine tools from U. S. companies. Machines needed are lathes, drill presses, milling machines, bench grinders and motors.

Several leading firms have already contributed such machinery which they no longer needed. After being reconditioned, these machines aid in forming a new base for China's economy.

Russian Steel Plant

MOSCOW — Gigantic construction operations involving 20,000 building and assembly hands and hundreds of engineers and technicians are going into the Transcaucasian Iron and Steel Works which will provide Georgia with its own iron and steel industry. This will save shipments of pig iron, steel and rolled metal into Georgia from the Donbas and Urals.

The project is scheduled for completion in 1950, the last year of the current five-year plan. The plant is expected to produce annually half a million tons of steel, the same amount of rolled metal, 430,000 tons of pig iron, metal for manufacturing autos and complex machine tools, tubes for oil fields, tin for canneries and huge quantities of coke.

Embracing dozens of square miles, the plant will include buildings for a blast furnace, open-hearth furnace, rolling mill, coking shops and a number of auxiliary plants.

Underground Plants—Profiting from wartime operations, Swedish manufacturers will continue using underground factories. Hewn out of solid rock (left), interiors are finished inexpensively. Typical aisles for peacetime work are shown

Names in the News

Trecker Decries Productivity Limitations At AMA Session

CHICAGO—Lashing out at organized labor's philosophy of limited productivity, Joseph L. Trecker, executive vice president, Kearney & Trecker Corp., asserted business men must convince employees that maximum productivity is the only sure road to steady jobs and a satisfactory margin between wages and prices. Speaking before the national conference of production managers sponsored Nov. 14-15 by the American Management Association, Mr. Trecker cited installation of new and modern equipment as the key to long-term survival.

Three commonly accepted rules affecting machinery replacement that, when put together, "don't make sense" according to Mr. Trecker are:

1. Average write-off period for machine tools is 20.74 years.

2. Average obsolencence period of machine tool models is about 7 years.

3. In normal times it is virtually impossible to sell a new machine tool unless you can prove to the customer that it will pay for itself in less than three years.

John D. Gill, economist and a director of The Atlantic Refining Co., pointed out that the factor of wages, prices, profits and production must be kept in equilibrium or forces tending to cause a decline of production become operative.

UAW Official Speaks

Speaking on labor productivity, Richard Leonard, vice president of United Automobile Workers of America, summarized basic policies of the UAW-CIO with regard to management's efforts to improve methods and lift output, as follows:

1. The union places no barriers in the pathway of basic technological improvement. The introduction of new machinery, new productive techniques and new methods, finds no opposition within the union. The union is concerned, however, to see to it that such innovations do not bring about reductions in the total level of employment or slashes in the hourly rates of workers in UAW plants.

2. The UAW does not accept or support any attempt to increase productivity through the intensification of the already adequate physical effort by workers employed in UAW plants.

3. The UAW-CIO is formally committed against any spread of incentive plans in plants through the industry. Our policy permits approval and continuance of established incentive plans but specifically denies authority for the approval of any incentive plan in plants where such systems of wage payment are not in effect.

Frank L. Magee

J. T. Myers

Frank L. Magee, general production manager for Aluminum Co. of America, has been made a vice president of the company and will continue performing his present duties.

J. T. Myers, assistant general manager, has been elected vice president in charge of sales and production of the Davey Compressor Co., Kent, Ohio.

American Brake Shoe Co. recently elected four top division executives as vice presidents of the parent company. The new officers include: **John S. Hutchins,** president of Ramapo Ajax Div.; **William T. Kelly, Jr.,** president of the Engineered Castings Div. and the Kellogg Div.; **Thomas W. Pettus,** president of the National Bearing Div.; and **Joseph B. Terbell,** executive vice president of the American Manganese Steel Div.

John V. Drum has been appointed manager of farm equipment sales of Graham-Paige Motors Corp.

W. M. Smith has been named general sales manager of the Bryant Chucking Grinder Co., Springfield, Vt., while **A. E. Stubbs** will serve as foreign sales manager.

Marcus A. Coolidge, president of the Seneca Falls Machine Co., Seneca Falls, N. Y., has been elected chairman of the board. He will be succeeded as president by **Edwin R. Smith,** for many years executive vice president and treasurer.

H. J. Leisenheimer, formerly executive vice president for foreign trade of Cleveland Tractor Co., has been appointed director of export sales for Hydraulic Press Manufacturing Co., Mt. Gilead, Ohio.

Joseph W. Eskridge has been named factory manager of the Hudson Motor Car Co., Detroit.

Herbert R. White, former General Motors Corp. executive and special assistant to the chief of ordnance during the war, has been appointed general manager of Eclipse Counterbore Co., Detroit.

John L. Gillis, former general export manager and assistant director of the foreign department, has been named to head the foreign department of Monsanto Chemical Co.

T. S. See has been appointed first vice president and general manager, while **A. Frank Golick** has been named vice president in charge of sales of the LaSalle Steel Co., Chicago.

L. H. Schneider has been named president of the Toledo Stamping & Manufacturing Co., Toledo, Ohio. Other officers elected at the same time include: **E. M. Tasker,** vice president in charge of sales and engineering and **R. M. Sawhill,** vice president and treasurer.

Carl R. Sare, formerly vice president, has been elected president and director of the Morrison Engineering Corp., Cleveland.

C. F. Borden has been named assistant general sales manager and **R. L. Asquith,** product sales manager, of the Iron & Steel Div., Kaiser Co., Inc., Oakland, Calif.

Eugene E. Wilson, former president, has resigned as vice chairman of the board of United Aircraft Corp., Hartford, Conn. Mr. Wilson will devote his time towards establishing an adequate national air policy.

O. W. Bynum has been named manager of direct sales, **John A. Gazelle** manager of distributor-dealer sales and **Carl U. Spriggs,** assistant general sales manager of the Carrier Corp., Syracuse, N. Y.

H. M. Dawson has been appointed managing director of Jessop Steel International Corp., wholly owned subsidiary of Jessop Steel Co., Washington, Pa., with offices at 75 West St., New York City.

Joseph P. Simon has been appointed district maanger of the Philadelphia office of Cutler-Hammer, Inc., Milwaukee, Wis.

Albert R. Knauss, formerly of Allis-Chalmer's Tulsa office, has been named manager of the Memphis, Tenn., office. Also **Charles F. Codrington** has been promoted to sales manager of the firm's blower and compressor department.

BUSINESS ITEMS

Rockwell Manufacturing Co., Pittsburgh, has acquired the **Ohmer Corp.,** Dayton, Ohio, and will operate it as a subsidiary. **N. J. Kenny,** assistant to **Col. Willard F. Rockwell,** president of the Pittsburgh firm, has been named president of the Ohmer Corp. Col. Rockwell heads the board of directors and **J. Allen Harlan,** Ohmer president for the past year, remains as vice president.

Barium Steel Co. has acquired the **Cuyahoga Spring Co.,** Cleveland, manufacturer of coil wire springs, wire forms and steel clips.

H. K. Porter Co., Inc., Pittsburgh, has moved its two **Quimby Pump** manufacturing operations from New Jersey to the company's plant in Lawrenceville.

American Foundry Equipment Co., Mishawaka, Ind., has changed its name to **American Wheelabrator & Equipment Co.**

The Lodge & Shipley Machine Tool Co., Cincinnati, has changed its corporate name to **The Lodge & Shipley Co.** because of the expanding operations of the company, notably in the Special Products Div.

Hydropress, Inc., New York City, has appointed **W. Herbert Everitt** as its sales representative in Wash., Ore., and B. C., with offices at 1743 First Ave. So., Seattle.

Borg-Warner Corp., Chicago, has purchased the **Superior Sheet Steel Co.,** Canton, Ohio, which will become a division of the corporation.

The Defiance Machine Works, Defiance, Ohio, has named **Edmund Burke Co.,** 3005 Detroit Ave., Toledo, Ohio, as its machine tool distributor in the northwestern Ohio area.

Block Machinery Co., Oklahoma City, Okla., has been incorporated by **Vernon L. Mock, G. W. Fisher** and **Earl G. Bolender.**

The Sanders Co., Rochester, N. Y., has purchased the **City Radiator Service,** Rochester. **John Sanders,** president of the Sanders concern, is production manager of the newly acquired operation.

Bryant Chucking Grinder Co., Springfield, Vt., is now handling all sales through the middle west directly through three newly established offices. One is in Detroit at 19003 Mendota under the direction of **L. C. Gilchrist,** while **Thomas Detherow** and **Walter Augustenovitch** will be in charge of the Chicago office at 329 So. Wood St., and the Cleveland office, located at 10022 Carnegie Ave., is under the management of **Robert F. Manley.**

Farrel-Birmingham Co., Inc., Ansonia, Conn., and Buffalo, N. Y., has reopened its branch office in Chicago at 120 So. LaSalle St. with **Harry Temporal** in charge.

Warco Sales Co., representing **Warren City Manufacturing Co.,** has opened a central district sales and service headquarters at 9 So. Clinton St., Chicago, to service Ill., Iowa, Minn., and northwestern Ind. **Norman M. Ramler** is in charge of the office as district sales manager.

The Valley Machine Co., Inc., 245 Fulton St., Wheeling, W. Va., has been formed as an engineering, machine building, and contract machining service in the Tri-State area. **H. F. Penney,** formerly works manager at Blaw-Knox Co., is president and general manager and **J. P. Mull** is vice president and superintendent.

Peerless Saw Co., Columbus, Ohio, has been acquired by **Bernard A. Hodapp,** president and general manager of the firm. **Robert Wylie** has been named sales manager.

Kelly Reamer Co., Cleveland, has appointed **Thomas C. Barber,** 140 N. Dearborn St., Chicago, as its exclusive sales and engineering representative in Wis.

Eastern Engineering Co., New Haven, Conn., manufacturers of midget pumps and industrial mixing equipment, has been consolidated with **Automatic Signal Corp.,** East Norwalk, Conn., makers of automatic traffic signals and relays.

Hamilton Standard Propeller Div., United Aircraft Corp., has named **Pacific Airmotive Corp.,** Glendale, Calif., as its exclusive far western distributor, with bases in Anchorage, Alaska, Seattle, Wash., Oakland, Fresno, Burbank and San Diego, Calif.

Carboloy Co., Inc., Detroit, has named **Silliter-Holden, Inc.,** 433 New Park Ave., Hartford, Conn., as its authorized distributor of cemented carbide tipped tools in Hartford and north central Conn.

The Brauer Tool & Machine Co., Inc., Oklahoma City, Okla., has been incorporated by **K. Brauer, Fred B. Wallace** and **H. W. Stancil.**

Walker-Neer Machine Co., Wichita Falls, Texas, has been incorporated as a machine shop by **W. W. Walker, Jack L. Neer** and **Carl L. Johnston.**

Monsanto Chemical Co. opened on Dec. 1 a sales office in the Keith Bldg., Cleveland, with **Robert H. Baugh** as supervisor. Also, the company's Plastic Div. has reorganized its New England territory. **J. Douglass Kirk** will be in charge of thermosetting molding materials in northern New England, while **T. J. Martin** will be in charge of them in the southern part. **Winston Richter** will handle the sale of thermoplastic materials in the north, while **William H. Face** will handle them in the southern section.

OBITUARIES

Charles E. Stephens, retired vice president of Westinghouse Electric Corp., passed away Nov. 19. Mr. Stephens joined Westinghouse in 1900 and in 1932 was elected a vice president, a post which he held until his retirement last year.

Elmer M. Kropp, 40, chief industrial engineer at Republic Steel Corp., died Nov. 15. He joined Republic in Youngstown in 1931 and four years later was transferred to Cleveland and named to his post of chief industrial engineer in 1943.

Dr. Sanford A. Moss, 74, General Electric consulting engineer, died suddenly Nov. 10. Dr. Moss was known for his pioneer work on aircraft superchargers, gas turbines and the development of turbosuperchargers.

Frederick W. Brehmer, 66, founder and president of the F. W. Brehmer Machine & Tool Co., Cincinnati, Ohio, passed away Nov. 11.

Irving L. Jones, president of the International Heater Co., Utica, N. Y., since 1931, died Nov. 2 after an extended illness.

Harry Selker, 65, treasurer and general manager of the Brass Products Manufacturing Co., Cleveland, died Nov. 12.

MEETINGS

National Association of Manufacturers. Annual Congress. Waldorf-Astoria Hotel, New York, N. Y. Dec. 4-6. National Association of Manufacturers, 14 W. 49 St., New York, N. Y.

National Exposition of Power and Mechanical Engineering. Grand Central Palace, New York, N. Y. Dec. 2-7. Charles F. Roth, manager, Grand Central Palace, New York, N. Y.

National Materials Handling Exposition. Public Auditorium. Cleveland, Ohio. Jan. 14-17. Ezra W. Clark, chairman, P. O. Box 178, Battle Creek, Mich.

Society of Automotive Engineers. Annual meeting and engineering display. Book-Cadillac Hotel, Detroit, Mich. Jan. 6-10. John A. C. Warner, general manager, 29 W. 39 St., New York, N. Y.

Shop Equipment News

LeBlond Dual Drive Lathe Has Gear and Belt Drives To Give Twelve Spindle Speeds; Swing Is 15 Inches

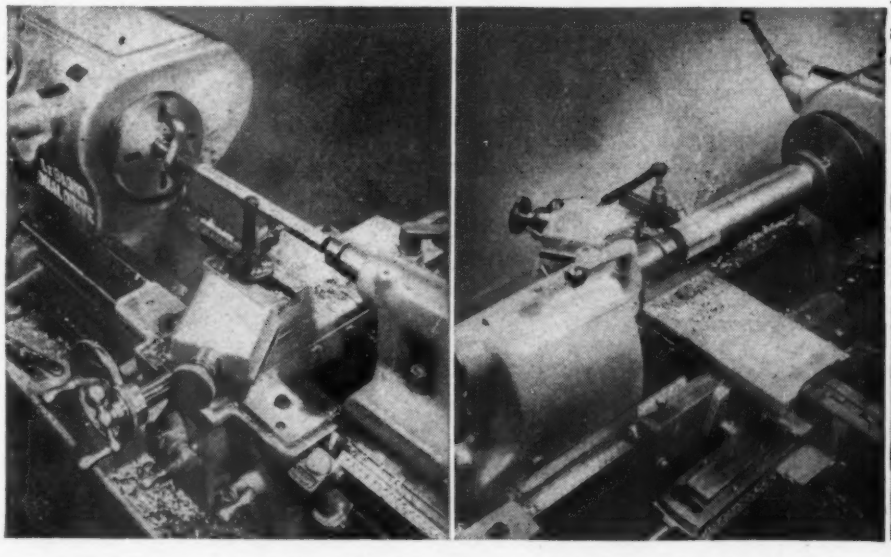
Alloy steel gears and shafts of the LeBlond Dual Drive run in oil which is provided by an automatic forced feed lubricating system. Gears in the quick change feed box are also lubricated by oil from main reservoir

The LeBlond Dual Drive, a new lathe which is built with a gear drive and a direct belt drive, is announced by the R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio. Designed to fill the gap that previously existed between the Regal and heavy-duty models, the new lathe swings 15 in. over the bed ways and can be built with center distances starting at 30 in. It is powered by a 3-hp. main drive motor.

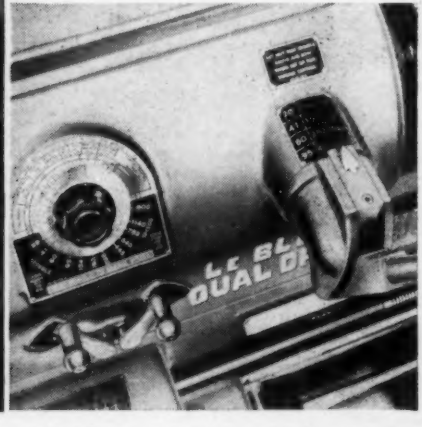
Twelve speeds are available, eight in the low-speed range and four in the high-speed range for use with carbide tools. The low speed, or gear drive, runs from the main V-belt drive through a gear train to the spindle. Speeds available are 28, 41, 60, 98, 134, 193, 282, and 445 rpm.

The high-speed, or direct belt drive, runs through four gear speed changes to a high-speed shaft, then direct to the spindle through a second double V-belt drive. The four speeds in this range are 540, 782, 1140, and 1800 rpm.

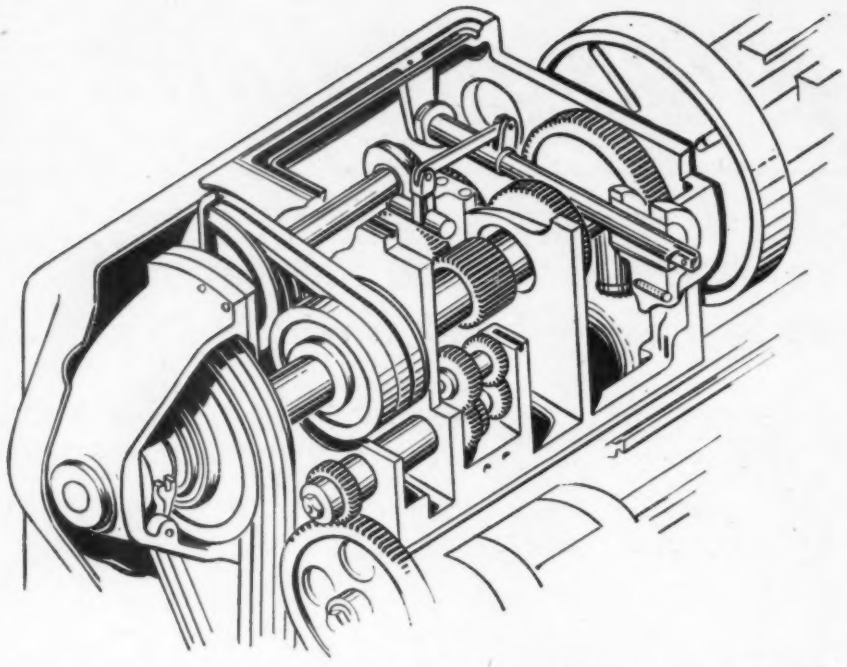
A single lever controls all 12 speeds and is fitted with an arrow which indicates the desired speed on a sub-divided plate. The quick-change feed box is totally inclosed,



Two operations on the lathe indicate typical applications. At left the lathe is in the low-speed range for thread chasing. At right the high-speed range is being used at 1800 rpm. for heavy stock removal with a carbide-tipped tool. Four speeds are for use with carbide tools



Single lever at right controls all spindle speeds. Selector at left indicates cutting speeds for the materials commonly encountered



Low-speed drive is from the main V-belt drive through a gear train to the spindle. High-speed drive cuts out the heavy gear train, runs from a high-speed shaft to the spindle through a second V-belt drive

and the gears are lubricated by oil pumped automatically from the main reservoir.

The electrical control panel located on the head-end leg contains start-stop pushbuttons, and drum switch for pre-setting direction. The panel includes start-stop pushbuttons for coolant so that pump and piping may be added at any time.

The lathe is equipped with the customary LeBlond one-piece apron with positive jaw feed clutch, one shot lubrication to all apron bearings, cross-slide, and carriage ways; and rapid speed selector for selecting correct cutting speeds for the frequently machined materials.

A multiple-disk clutch and brake with two-station control and multiple automatic length stops are included. The chip pan is designed to appear to be an integral part of the lathe.

Standard equipment includes the 3-hp., 1800 rpm., reversing-type motor, large and small face plates, steady rest, graduated compound rest, toolpost, taper spindle sleeve, standard No. L00 taper spindle nose, chasing dial, adjustable thread cutting stop, multiple automatic length stops, centers and necessary wrenches.

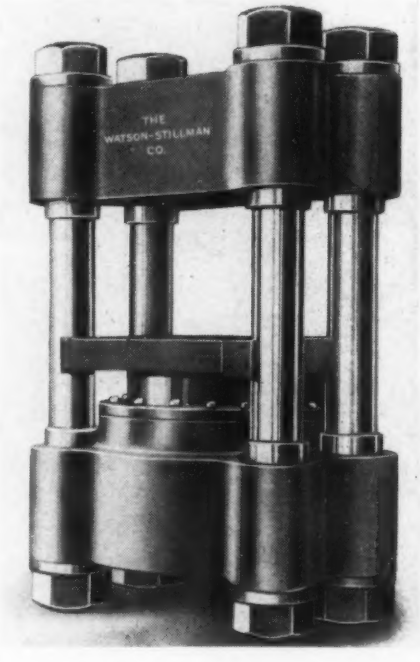
GE Switches and Indicators Have Oiltight Construction

Oiltight push-button units, selector switches, and indicating lights designed for use on machine tools are announced by the Control Division, General Electric Co., Schenectady, N. Y. A diaphragm seal and rubber gasket are used in the unit to prevent entrance of oil.

The pushbutton unit includes a single-pole unit, either normally open or normally closed, a double-pole unit also either normally open or normally closed, and a three-point unit which provides two normally open circuit.

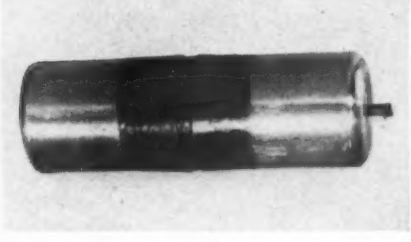
The selector switch is available in single-pole, double-throw, or double-pole, single-throw forms.

Watson-Stillman Hobbing Press Has Hand or Motor-driven Pump



A 500-ton hydraulic hobbing press, built by Watson-Stillman Co., Roselle, N. J., has platens of open-hearth steel castings, with surfaces tooled to a smooth finish. Adjustable babbitt guides serve as bearing surfaces for moving the platen. It can be supplied with hand or motor-driven pumps.

Mercontrol D-100 Mercury Switch Rated at 100 amp., 110 or 220 v.



A mercury switch for remote control and automatic machinery, and which is also applicable to tank rheostats on plating equipment, is announced by Mercontrol, Inc., 278 Pearl St., New York 7, N. Y. The type D-100 switch has a full-load rating of 100 amp., at which it is said to operate only 25 C above the temperature of the surrounding air.

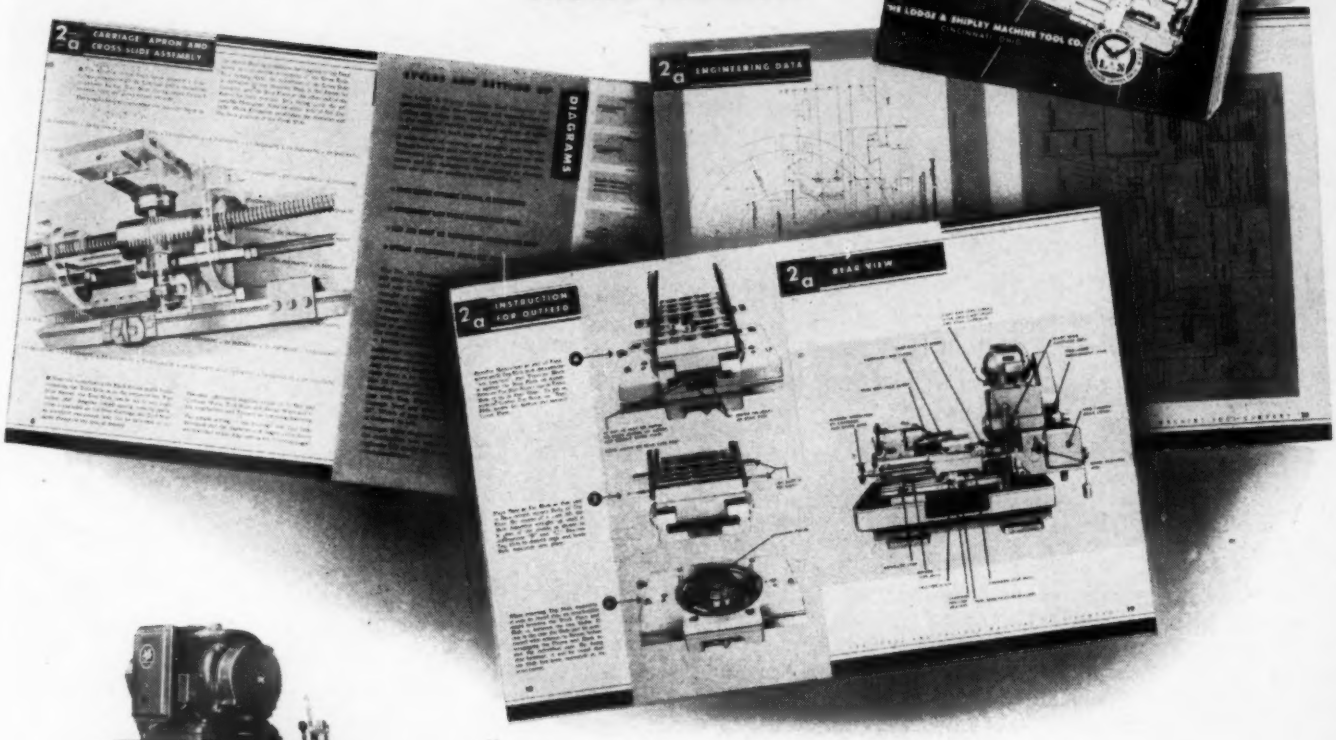
The switch is 4 in. long and 1¼ in. in diameter, with a fused hermetic seal between metal and ceramic.

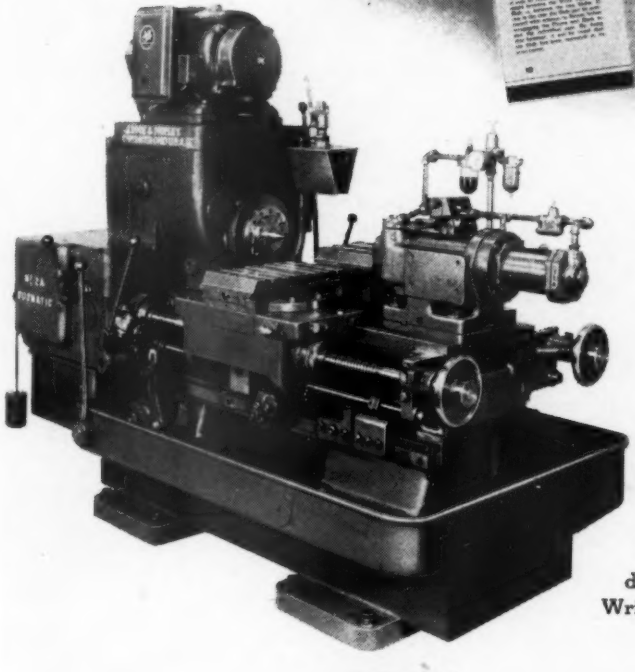
Texaco Heavy-Duty Soluble Oil Is Made for High-Speed Cutting

Texaco Heavy Duty Soluble Oil has been developed by The Texas Co., 135 E. 42 St., New York, N. Y. The new oil is said to have the cooling properties of soluble oils combined with the high-speed cutting characteristics of sulfurized mineral oils, permitting higher cutting speeds.

Get far more in QUANTITY PRODUCTION on small lathe work

...THIS FREE BOOK SHOWS YOU HOW





● This 32-page, fact-packed book contains page after page of cycle and setting-up diagrams; angular infeed turning, front or rear turning, facing, boring, angular turning, angular facing or grooving plus other engineering data and examples of actual jobs done on the new 2-A Duomatic. You'll get a new idea of the money-saving, money-making possibilities this new production lathe offers.

The Lodge & Shipley 2-A Duomatic is a smaller model of the well-known 3-A Duomatic. Just like the 3-A, this new lathe is like two lathes in one with dual tool slides, front and rear, operating singly or together. The 2-A is completely automatic—the operator merely loads the workpiece, starts the cycle, then unloads the finished piece.

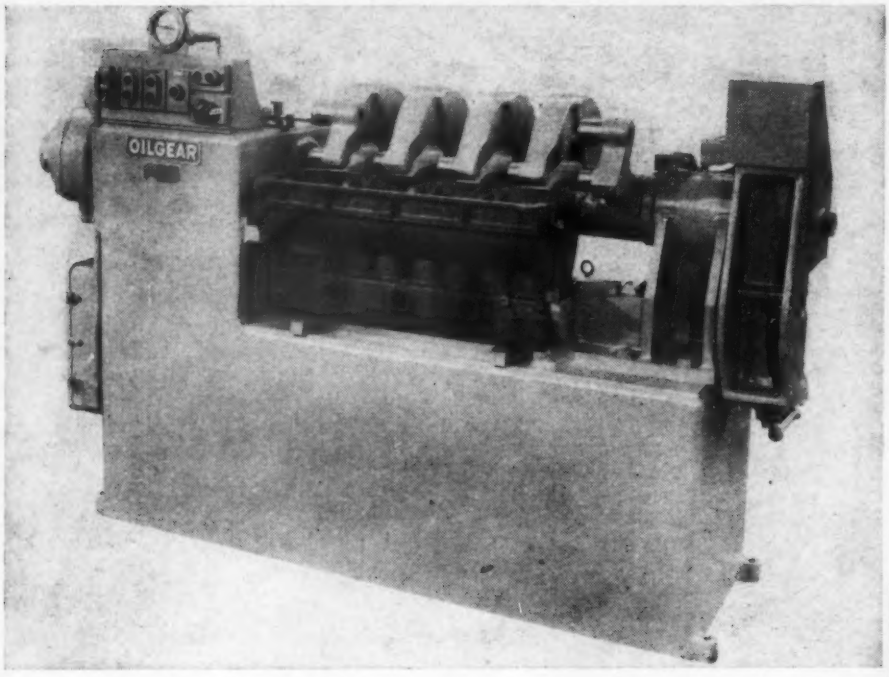
Get this valuable information plus complete specifications and detailed photographs of the Lodge & Shipley 2-A Duomatic. Write on your company letterhead for Bulletin 635.

ENGINE
TOOL ROOM
MANUFACTURING
OIL COUNTRY
DUOMATIC (AUTOMATIC) LATHES

THE LODGE & SHIPLEY MACHINE TOOL CO.
CINCINNATI 25, OHIO, U. S. A.
MACHINE TOOL DIVISION 3055 COLERAIN AVE. • SPECIAL PRODUCTS DIVISION 800 EVANS ST.

L & S LATHES

Oilgear 15-ton Special Press Inserts Five Camshaft Bushings



Electric Switches and solenoid-operated valves control operation of this 15-ton press which assembles five camshaft bushings in cylinder blocks

Five different sizes of camshaft bushings are installed in eight-cylinder motor blocks in a single operation on the 15-ton camshaft bushing assembling press built by The Oilgear Co., 1301-1417 West Bruce St., Milwaukee 4, Wis. On the new press, the operator merely slips camshaft bushings on pins and guides the block to assembly position.

A single pushbutton is used to start the operating cycle. Control is interlocked so that the bushing bar is not rotated into assemblying position nor pulled inward to press the bushings home until the bushings have been placed on the pins and the operator has guided the motor block into approximate position.

The small hydraulic actuated plug automatically enters the end cam bushing hole to locate the block angularly. A hydraulically actuated rack and pinion turns the bushing bar to lower the bushing in line with the camshaft bearing holes, and the large guide pins in line with front and rear main bearing holes. The main ram pulls the bushing bar to accurately position the motor block on pins entering the main bearing holes as the five camshaft bushings are pressed home. The main ram pushes the bushing arm back and the hydraulically actuated rack and pinion turns the bushing bar to raise bushing horns, completing the automatic cycle. The machine is designed so the engine block is at conveyor height.

Manual pushbutton operation is possible. An emergency button will stop the cycle at any point, and a reset button will return the bushing arm to loading position.

An Oilgear type DX-811 two-way variable delivery pump is direct connected to a 7½-hp. motor to provide fluid power to operate the locating plug ram, the rack and pinion cylinder, and the main bushing bar cylinder. Independent adjustment of pressing and return speed is possible.

Matthews Airgrit Marker Uses Blast of Fine Grit

The Airgrit marking machine for parts with a ground or mirror surface that should not be marred or distorted is announced by James H. Matthews & Co., 3942 Forbes St., Pittsburgh, Pa. A short blast of fine grit against rubber or celluloid stencil masks, produces a light, clear impression without a blurred surface. Parts can be marked as fast as they can be handled by the operator.

The machine operates by air pressure at about 10 psi. An electric timing unit can be used to fix the length of blast so that parts will be marked uniformly. Best results are obtained by using characters at least 1/16 in. in size, but it is possible to use characters as small as 0.055 in.

Karge Slender Turning Process Produces 40-ft. Tapered Shafts

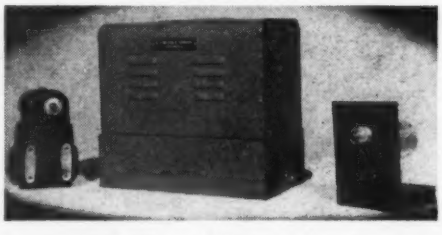
A process for turning slender parts has been patented by Karge & Son Machine Co., Brockport, N. Y. Work with diameters from 1/32 to 1 in. and lengths up to 40 ft. can be turned. Slender taper shafts can be produced by the process.

The process is said to produce parts to very close tolerances.

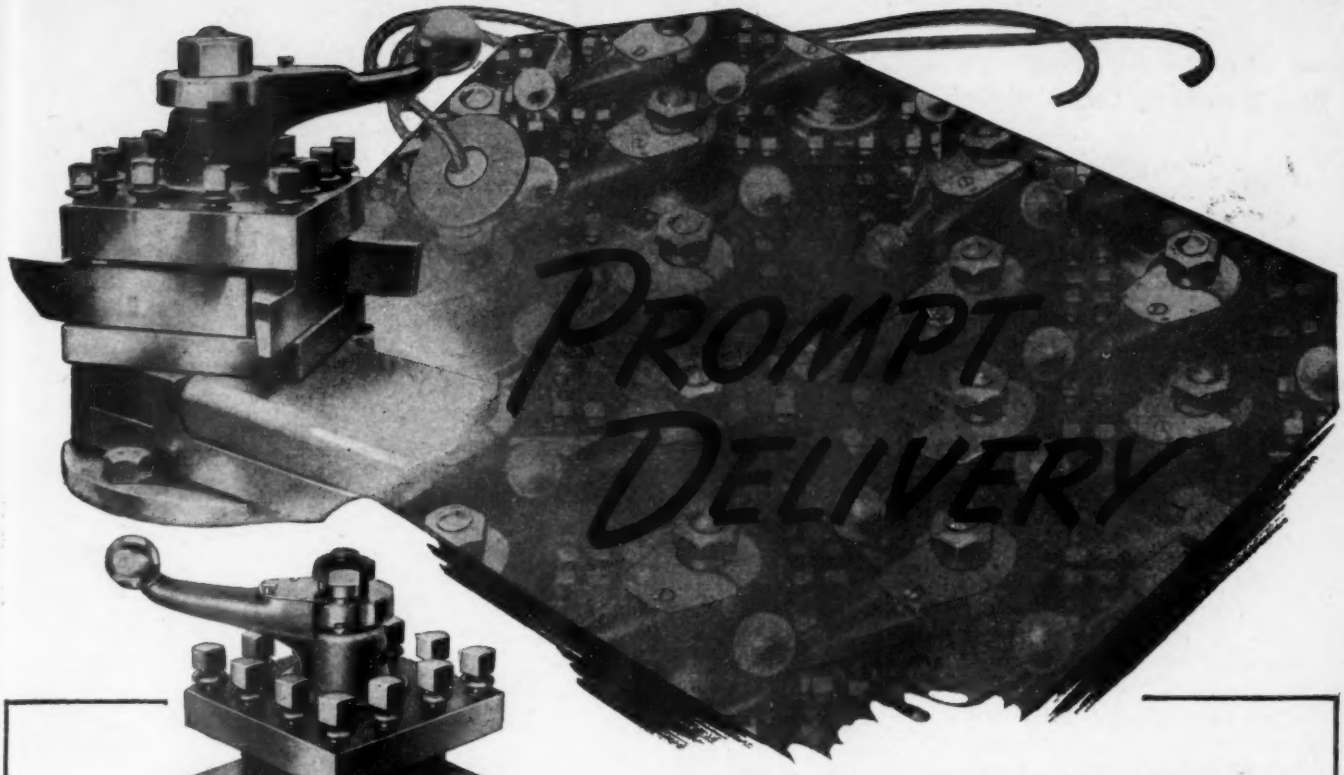
Ideal's Electric Tachometer Is for Permanent Installation

An electric tachometer for permanent installation is announced by Ideal Industries, Inc., 1057 Park Ave., Sycamore, Ill.

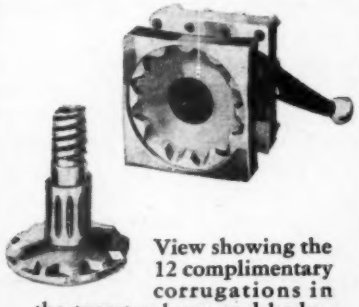
The generator or "pick-up unit" is permanently mounted on a machine; the meter can be mounted on a panel which is 200 or more feet away. Meters are available in 3- and 7-in. sizes with scales of 1250, 2500, and 5000 rpm.



SERVO—MECHANISM—Servo for remote indication or control consists of (left to right) torque unit, amplifier, and control. Built by G. C. Wilson & Co., 2 N. Passaic Ave., Chatham, N. J., it operates from 115 volts, 60 cycles power. The system is sensitive to 1% changes in the control unit and develops a maximum of 50 lb. of torque in the torque unit



# of McCROSKY *Turret* TOOL POSTS



View showing the 12 complimentary corrugations in the turret column and body—an exclusive McCrosky feature—that assures accurate indexing to extremely close limits and provides the rigidity needed for heavy cuts.

● Featuring a service proved design, conceived, perfected, and available only from McCrosky, TURRET Tool Posts permit successive tools to be swung into cutting position easily, quickly, and accurately, without stopping the machine for tool changes. They speed up production, and give engine lathes the versatility of turret lathes. The indexing corrugations on the post and body with their long shore line of contact are finished to extremely close tolerance on specially built machines. This construction provides the extreme rigidity needed to withstand the thrust of the cut—minimizes wear—and assures accurate indexing within the close limits required for repetitive work.

McCrosky TURRET Tool Posts are endorsed by all well known lathe manufacturers,— and are used extensively by leading concerns from coast to coast. Furnished in five styles including square and hexagon designs,— nine different sizes. Write for Bulletin No. 16-E. It gives full details.

McCROSKY TOOL CORPORATION
MEADVILLE, PA.

COST CUTTING TOOLS

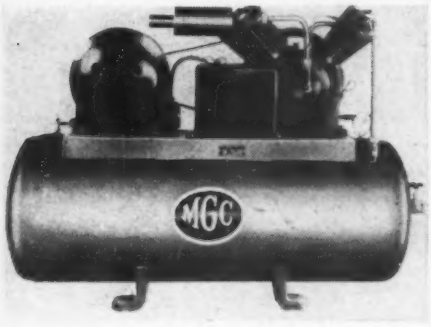
Designers and Manufacturers of

Jack-Lock Milling Cutters — *Super Adjustable* Reamers

Block Type Boring Bars — *Turret* Tool Posts

Wizard Quick-Change Chucks — *Special* Multiple Operation Tools

Motor Generator Air Compressors Have Automatic Control Valves

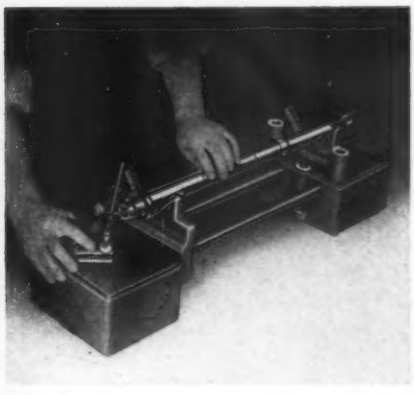


Super-duty, two-stage air compressors with 7, 9, 13 and 21 cu. ft. capacities are announced by Motor Generator Corp., Div. of Hobart Bros. Co., Troy, Ohio. The 7 cu. ft. unit has a 60- or 80-gal. storage tank, and the other models have an 80-gal. storage tank.

The compressors are fully automatic and controlled by centrifugal-type unloading valves. The pressure-switch contacts close at minimum air requirement and open at maximum air requirement.

A fan-type flywheel circulates air past a copper finned intercooler which cools the air as it passes from the low- to high-pressure cylinders. Cylinder heads and cylinders have fins to increase cooling capacity.

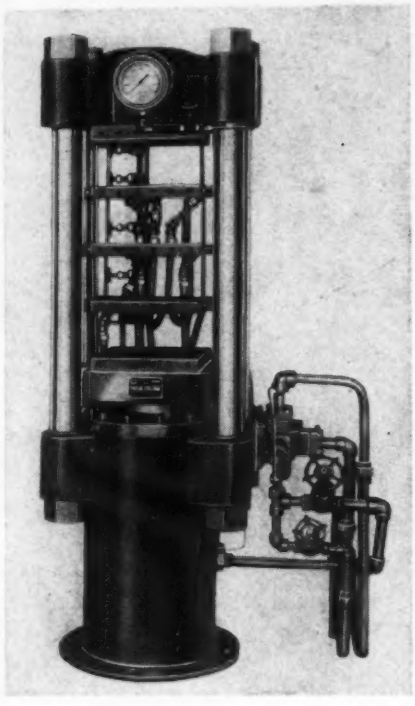
Swanson V-Liner Checks Parts Which Have Multiple Diameters



The V-Liner produced by Swanson Tool & Machine Products, Inc., 814 E. 8th St., Erie, Pa., is designed to aid in checking and inspecting relative concentricities on round parts. It determines the proper centerline height required for any combination of diameters involved in a workpiece.

The V-Liner includes two V-blocks mounted on solid members and held in correct alignment by cylindrical rods. One of the V-blocks can be moved as desired to vary the distance between them, and is vertically adjustable. The adjusting screw on this block is set to correspond to the diametrical difference between any two diameters in the piece to be checked to position the part horizontally.

In addition to use for inspection and checking, the V-Liner may be used for positioning and holding parts for light milling, drilling, and surface grinding operations. Models available will handle diameters from ¼ to 6 in. and maximum length up to 24, 36 and 48 in.



HEATING PRESS—A stop valve which locks pressure in suits this 150-ton press for plastic hot pressing and laminating. The press, which is made by Watson-Stillman Co., 75 West St., Roselle, N. J., can be fitted with a standpipe and flexible hose connections for admitting steam and water for heating and cooling the plates. Operating pressure is 2400 psi., with a platen size 14 x 14 in., and a ram stroke of 16 in.

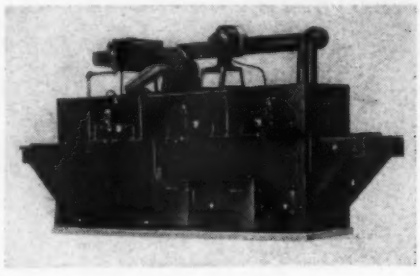
Super Tool Carbide-tip Cutters Are Made for Milling Cast Iron

A line of standard carbide-tipped cutters for milling cast iron is announced by the Super Tool Co., Detroit, Mich. The cutters are made in plain, side, half side, shell and face mill forms. High production rate and excellent finish are claimed at low cost per piece.

Goodrich Industrial Apron Made of Ameripol Synthetic

A heavy duty, oil-proof apron is announced by The B. F. Goodrich Co., Akron, O. It is made of Ameripol synthetic rubber, and measures 34 x 47 in. and weighs 1½ lb.

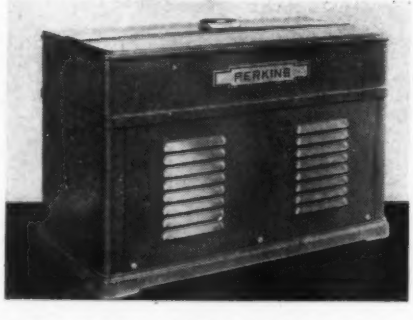
Optimus Spray Washing Machine Carries Parts on Flat Conveyor



A flat-conveyor type, spray washing machine, adaptable for cleaning and other spray operations or for drying, is announced by Optimus Equipment Co., 151 Church St., Matawan, N. J.

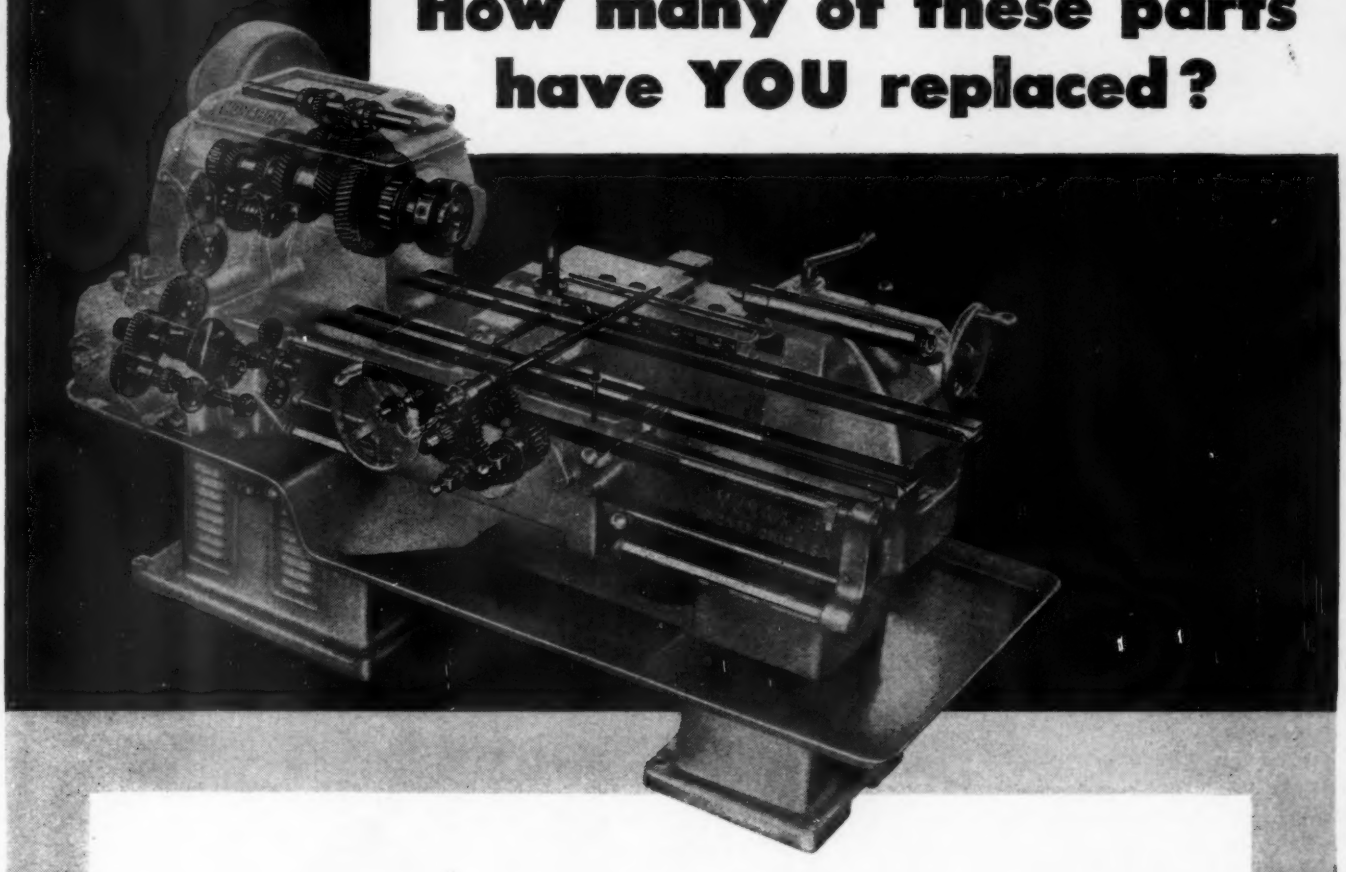
Parts to be cleaned can be laid on the conveyor or handled in baskets or on racks. The machine has a long horizontal tunnel placed on top of a series of solution tanks. A continuous flat conveyor carries parts through the series of operations with solution forced on the part through a battery of spray nozzles.

Alkaline, acid, solvent type, air drying, oil spray and similar operations can be handled. Size and method of heating can be varied to suit requirements.



HYDRAULIC POWER UNITS — Series includes power units from .75 to 34 gpm., using pumps with 1000, 3000, and 10,000 psi. maximum pressure. Built by B. F. Perkins & Son., Inc., Holyoke, Mass., the units are furnished with pump, motor, reservoir, filter, oil level gage, and adjustable pressure control valve

How many of these parts have YOU replaced?



• If you're using a Monarch Turning Machine the answer is easy—with rare exceptions it's "*None*".

Every dark area in this phantom view indicates a hardened bearing surface or a part made of hardened alloy steel. Monarch has pioneered the use of hardened steel parts—as well as the application of different hardening processes—to lathe building. Induction-hardened lead screws—flame-hardened ways—these are two typical examples of how Monarch design gives you *peak production at a profit*—and dependable long life at sustained accuracy.

While your present lathe may offer equal protection on certain few strategic parts, no other lathe can give you the universal and all-inclusive protection features you'll find on a Monarch. The result is more universal adaptability for you.

You can change from chucking to between-centers work—from thread chasing to hogging off stock on first operations—from short-traverse precision work to large-parts production that taxes the limits of the machine—and in each case you'll get toolroom accuracy at production line speed.

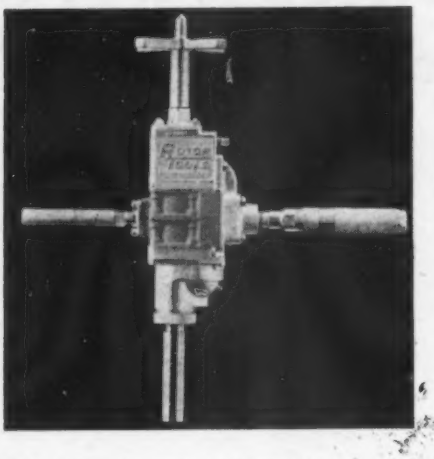
When you want the ultimate in performance, Monarch Turning Machines—*with hardened structure*—will give you the most for your money *at any price.* May we furnish more details?

ACCURACY · ECONOMY · LONG LIFE

Monarch
TURNING MACHINES

THE MONARCH MACHINE TOOL COMPANY • SIDNEY • OHIO

Rotor Intermediate Air Drills Include Interchangeable Parts



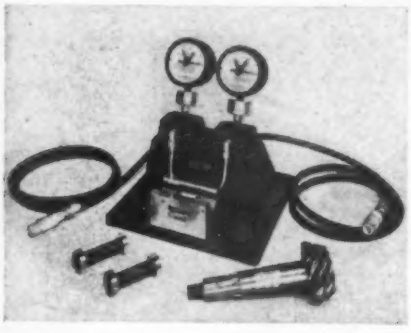
Air drills in two intermediate sizes, E-22 and E-42, are announced by the Rotor Tool Co., Cleveland, Ohio. Both drills use the same motor and have many interchangeable parts. Magnesium is used in both tools to keep the weight down.

Model E-22 has a capacity of 9/16 in. for drilling, ⅜ and ½ in. for nut setting, and ⅜ in. for lag screws and ½ in. for machine screws. The drill, which weighs 9 lb., has speed of 625, 750, 1000, and 1200 rpm. This model has a spade handle with auxiliary side handle and may be equipped with a chuck or No. 1 or No. 2 Morse Taper.

The Model E-42 is available in reversible and non-reversible models, weighing 13½ lb. Capacity is 9/16 and ⅞. in for drilling, ⅜ and ⅝ in. for reaming and tapping, and ⅜ and ½ in. for nut setting. It is furnished with a No. 2 Morse taper feed screw.

Both tools have governor control. Immediate delivery is promised.

Moore Products V-block Unit Gives Air Gaging of Round Work

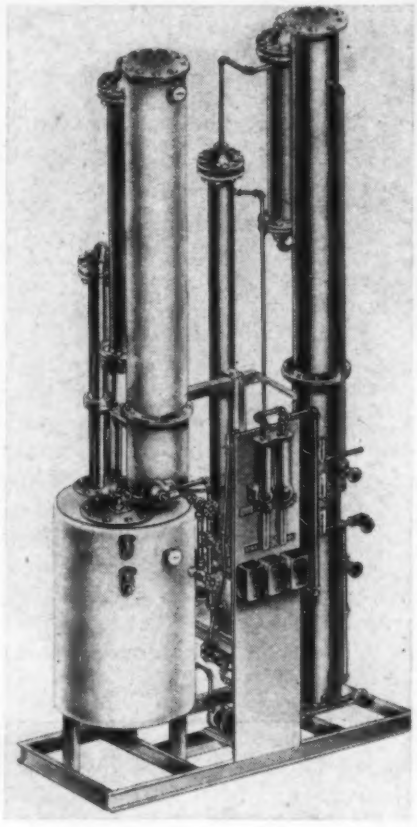


A V-block pneumatic unit for measurement of one or more outside diameters has been developed for the pneumatic comparator gage made by Moore Products Co., H and Lycoming St., Philadelphia 24, Pa. Diameters between 0.150 and 8 in. can be measured.

The model illustrated measures two diameters on the pinion shaft and is used by an automotive manufacturer to select parts within 0.00005 in. Parts are rotated to check for out-of-round and slipped axially to check for taper.

The weight of the part is supported on carbide wear strips with the nozzles which perform the measuring recessed below the surface. The gage can be installed at the grinding machine without being affected by dirt, oil and coolant.

GE Neutralene Gas Producer Gives Heat-treat Atmosphere

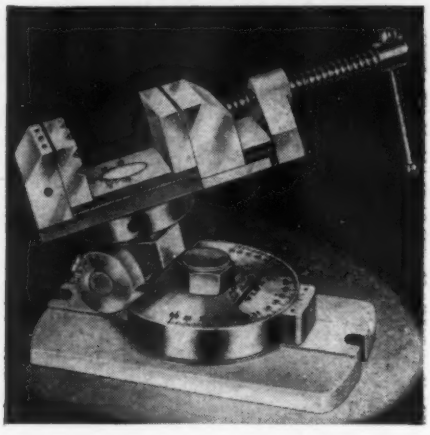


Neutralene gas producing equipment to provide a neutral, CO_2-free, dry, combusted gas for heat-treating medium- and high-carbon steels without decarburization is announced by the Industrial Heating Div., General Electric Co., Schenectady, N. Y. The atmosphere produced is said to be suitable for bright annealing, clean hardening, furnace brazing and sintering.

The equipment includes a combined combustion chamber and reactivating tower, CO_2 absorbing tower, gas cooler, heat-exchanger, and liquid cooler. A refrigerated gas cooler and activated alumina dryer are furnished for drying the gas.

The analysis of Neutralene gas may be varied over a relatively wide range for specific applications. Energy previously wasted in the water jacket of the atmosphere gas converter is now utilized to supply heat to the boiler of the reactivating tower. This is said to save about 18 kw. hours per thousand cubic feet of gas produced.

Machinists Tool Co. Vise Has 90° Vertical Adjustment



A vise which swivels 360° on its face, and has 90° vertical adjustment, the Matco All-Angle, is made by Machinists Tool Co., 2834 West Lake Street, Chicago 12, Ill.

The vise is suitable for use on grinders, drill presses, and other machine tools or for bench use. The replaceable jaws may be hardened and ground or V-grooved.

Acromark Stamping Machine Has 3/32-in. Pressure Stroke

The Acromarker No. 1AR, developed by The Acromark Co., 7-13 Morrell St., Elizabeth 4, N. J., is about the size of a No. 3 arbor press. Construction is similar to that of an arbor press with the lettering and numbering head set in the lower end of the ram.

The pressure stroke for lettering and numbering is 3/32 in. and is applied by swinging a lever at the front of the machine which lifts the table and the work against the die. A rotary fixture can be placed on the marking table to handle work when stamping in a curved line is required. Changes of numbers and

Announcing

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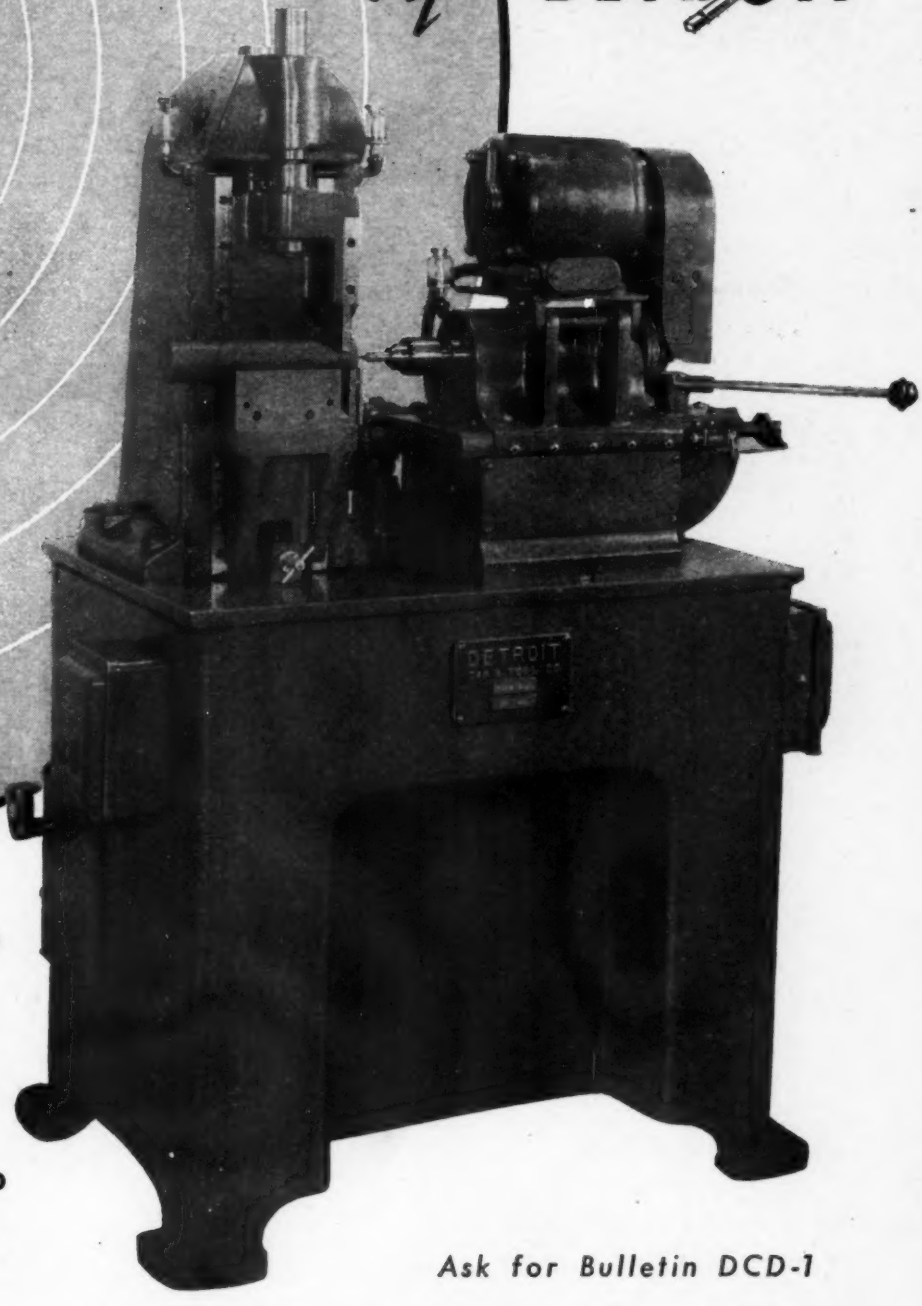
by DETROIT



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- MAXIMUM OUTPUT
- MINIMUM SKILL REQUIRED
- WIDE RANGE OF STOCK

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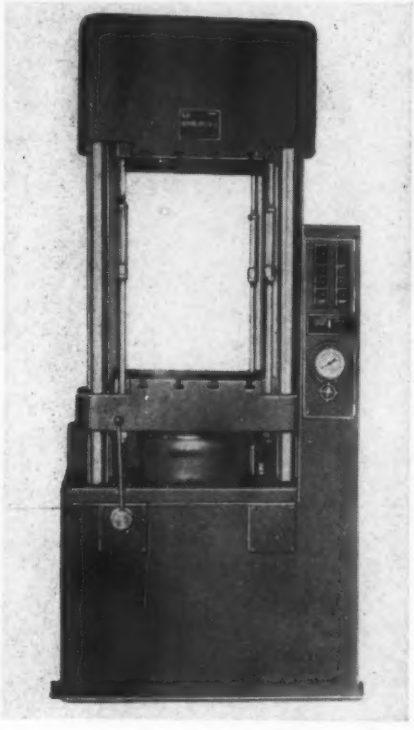
letters are made by twirling the lettering and numbering head with the right hand. Delivery is promised in two to four weeks.

Watson-Stillman Molding Press Made for High-speed Operation



A semi-automatic, 200-ton capacity compression molding press designed for high-speed operation is announced by Watson-Stillman Co., 75 West St., Roselle, N. J.

All internal pressure seals are made with piston rings, while external packings are of the V type and are accessible under glands. External stuffing boxes have bronze throat bushings.

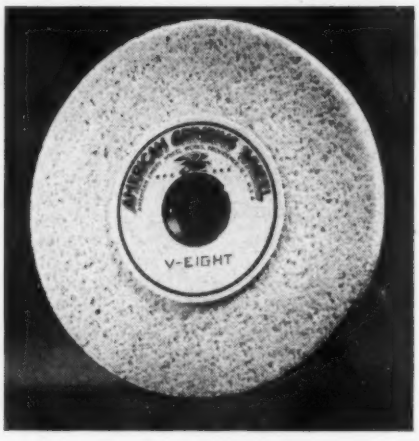
Designed for maximum accessibility of working parts, the moving platens have integral, barrel-type guides for the column.

The stroke is 15 in. with an advance speed of 52 ipm., pressing speed of 12.5 ipm., and return speed 100 ipm. A 7½-hp. motor provides the power.

Speedex Insulation Stripper Handles Wire Sizes 8 to 30

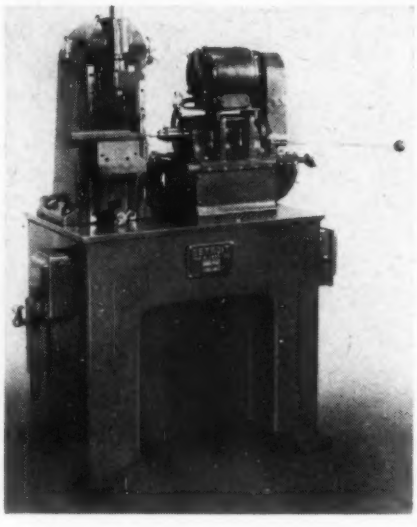
Insulation can be stripped from wire of sizes 8 to 30 with the Speedex 733-K Stripper Kit, produced by General Cement Manufacturing Co., 919 Taylor Ave., Rockford, Ill. The stripping tool and seven interchangeable blades are packed in a small steel kit.

American Emery V-Eight Wheel Made with Porous Structure



American Emery Wheel Works, Providence, R. I., announces V-Eight grinding wheel which is of porous structure but is claimed to hold its corners even under heavy cuts and to perform efficiently in dish and cup shapes. In tests, the wheel is said to have cut 0.012 in. on Rockwell 60 C hard steel without loss of corner; 0.030 in. on soft tool steel, and 0.040 in. on oil-hardened tool steel.

Detroit Tap & Tool Center Drill Is Controlled by Single Lever



Automatic centering and clamping are included on a high-production center drilling machine announced by Detroit Tap & Tool Co., 8432 Butler Ave., Detroit 11, Mich. A single lever controls all operations, including automatic positioning, clamping, and feeding the drill.

Output is said to be materially higher per machine hour than with previous equipment. Concentric centers may be drilled in round or other forms of stock ranging from ⅛ to 2⅜ in. outside diameters.

The self-centering vise is actuated by a hydraulic cylinder. Two racks which mate with a fixed pinion transmit opposed vertical motion of equal amount to the upper and lower jaws of the vise. True vertical alignment is said to be maintained because each of the jaws is mounted on hardened and ground adjustable ways.

The drill head travels on hardened and ground adjustable ballbearing ways. The drill has speeds of 1250, 2400, or 5200 rpm.

Garfield Work Positioner Has Single Control Knob

A universal work positioner, the Powrarm, is produced by the Garfield Engineering Corp., Kansas City, Mo. The positioner is said to hold light or heavy work, and can be turned 360° horizontally and 180° vertically. Position of work is changed by adjustment of a single-pressure control knob. This is possible because of a new principle of pressure applied to a ball and socket joint. The positioner is produced in hydraulic and mechanical models. Attachments for mounting many types of work are available.

Tennant Floor Maintenance Unit Will Operate Under Machinery

A floor machine with an overall height of less than 12 in. for polishing, scrubbing, steel wooling and other maintenance, is announced by G. H. Tennant Co., 2530 N. Second St., Minneapolis 11, Minn. The brush has bristles extending beyond the circumference of the disk and ap-

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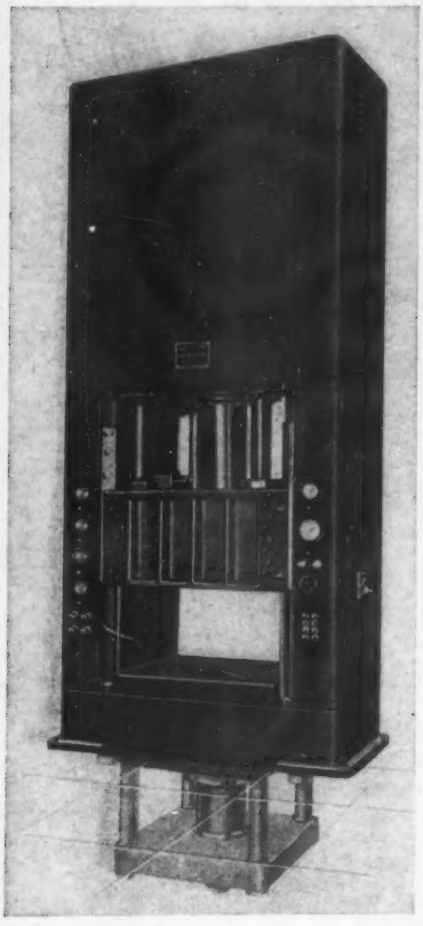
AMERICAN PHILLIPS *Screws*

ALL TYPES

ALL METALS: Steel, Brass, Commercial Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)

proximately two inches above the floor. The low height permits the machine to operate under machinery or desks.

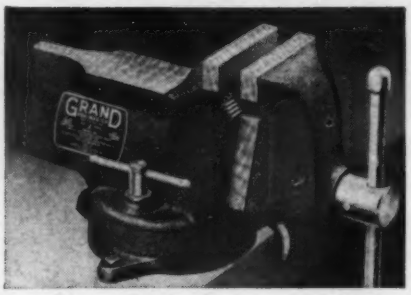


DRAWING PRESS — 250-ton, double-action, hydraulic press has a 36-inch operating stroke. Built by Watson-Stillman Co., 75 West St., Roselle, N. J., it has a single-action die cushion cylinder. The die ram is 11 in. in diameter with a 14-in. stroke. The machine has manual control and single-cycle automatic operation

Tubular Micrometer Series Has Sapphire Wear Surfaces

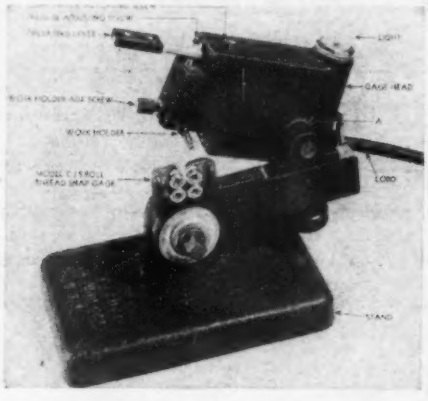
Tubular "Feather Touch" micrometers are now available with the spindle and anvil tips mounted with sapphire wearing surfaces, it is announced by Tubular Micrometer Co., St. James, Minn. The series is available in 1-, 2-, and 3-in. sizes.

Grand Specialties Bench Vise Opens with a Trigger Release



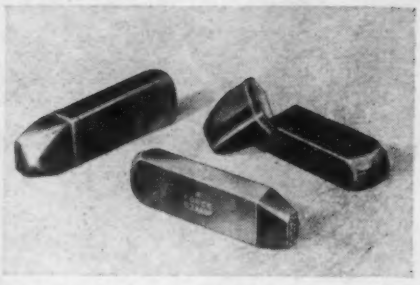
A heavy-duty bench vise, the "Vise Master" is announced by Grand Specialties Co., Grand Ave. at Troy St., Chicago 22, Ill. The vise can be closed by a push on the free jaw and opened by trigger release. It will revolve 360° on its base. The vise weighs 23¾ lb. and has a maximum opening of 4⅜ in.

Pratt & Whitney Roll Comparator Inspects Threads on Small Screws



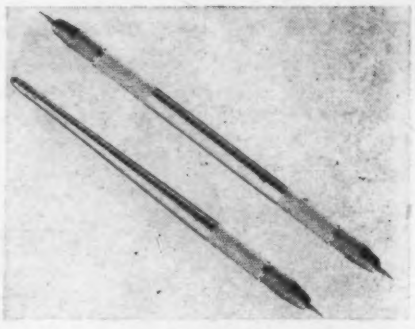
Small diameter screws of fine pitch are inspected in the Model C Roll Thread Comparator with pressure control built by Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford 1, Conn. The instrument is designed for inspection of screws with diameters ranging from 0.060 to 0.216 in. and threads of 80 to 28 per in. National Form 60°.

The comparator uses the J-S gaging principle with a pressure control feature to relieve the operator of responsibility for judging results. Correctly threaded screws pass the "go" rolls without resistance, but will not pass the "no go" rolls without resistance. Oversize screws meet resistance at "go" roll while undersize screws pass through both steps without resistance. Whenever resistance is encountered the signal light goes out.



MARKING TOOLS—Marking tools and dies are now being supplied with an ebony finish by William A. Force & Co., 216 Nichols Ave., Brooklyn 8, N. Y. This glossy black finish provides a protective coat which prevents deterioration and corrosion. Dies are furnished in a transparent plastic coating for protection until ready for use

Elastichuck Aluminum Pencil Holds Lead in Rubber Collet

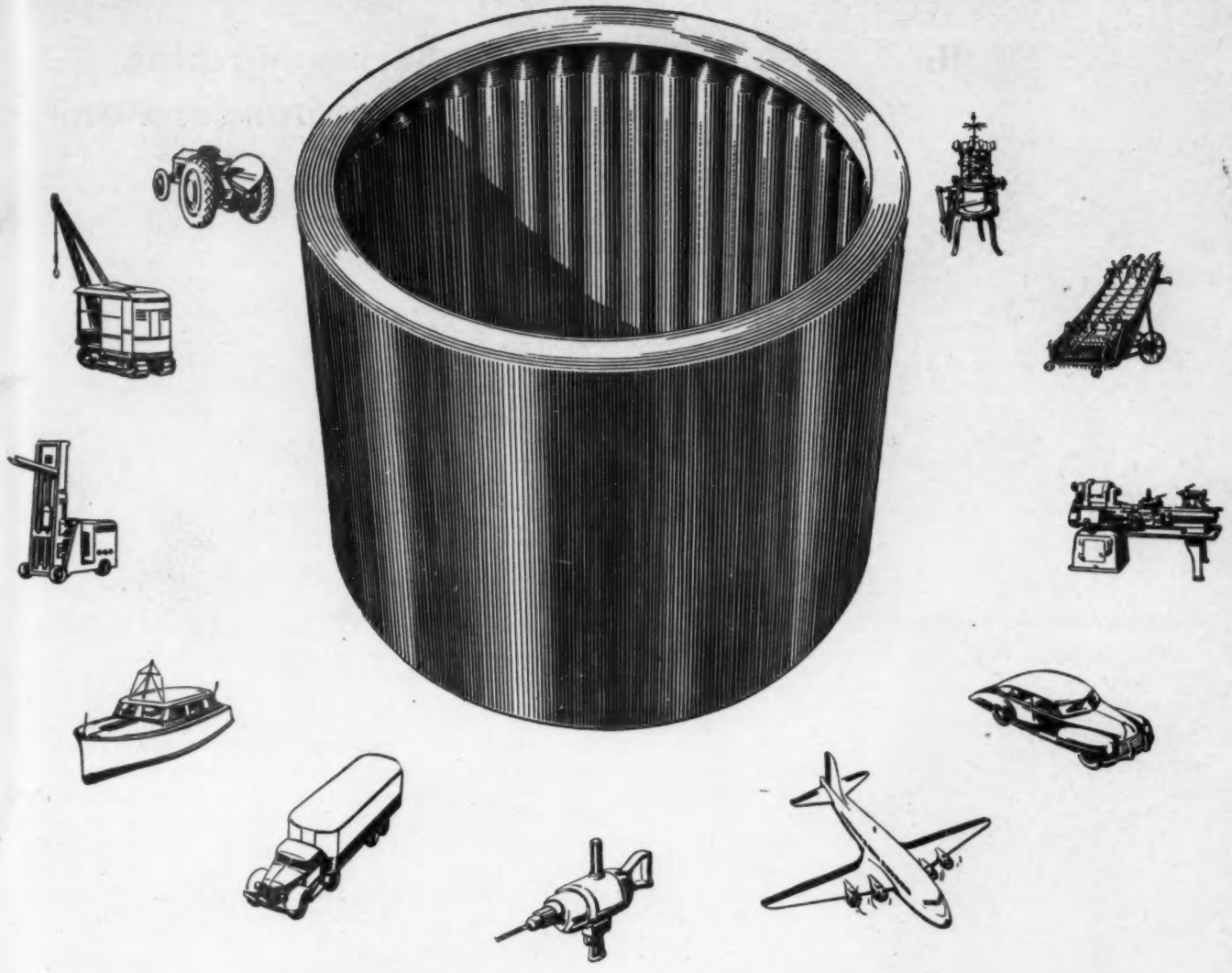


An aluminum drafting pencil with a rubber collet to grip the lead has been announced by Elastichuck Sales Co., Inglewood, Calif. The rubber collet is the only contact between lead and pencil and is said to cushion it against undue pressure. The chuck is of hard steel which cannot be damaged when sharpening lead against a file or sandpaper pad. An index tip identifies the lead in the pencil.

Wilder Projector Lights Surface With Ring of Bulbs Around Lens

A new type of surface illuminator for the Wilder Projector is announced by George Scherr Co., 200 Lafayette St., New York 12, N. Y. Previously reflected images were produced by directing a beam of light obliquely against the surface of the work. The illumination thus obtained has been rather uneven.

In the new model a ring of eight low-voltage bulbs is mounted in the compact circular lamp house which surrounds the projector lens. This



It has an ever widening circle of application

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The reason lies both in their tremendous radial capacity—greater in relation to O.D. than in any comparable bearing—and in their low coefficient of starting and running friction —with no practical speed limitation on their application. Behind these advantages lies the principle of Needle Bearing design—a full complement of small diameter precision rollers which provide maximum area of bearing contact surface.

Then too, many other important Needle Bearing features—compact size, unit construction for easy installation, efficiency of lubrication and low initial cost—widen the scope of their application to modern machines.

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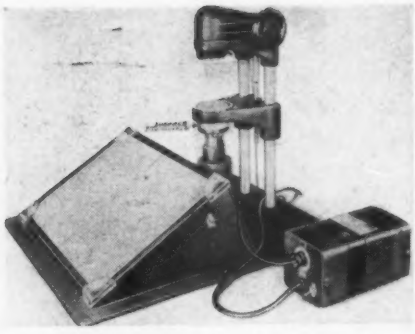
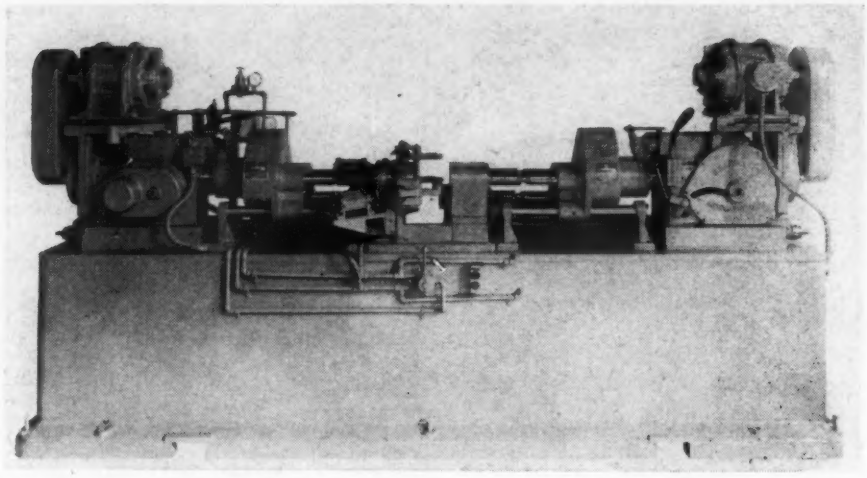


intense light is directed vertically against the surface of the work to provide uniform illumination over the full area of the lens and screen. The surface illuminator can be removed from the lens when desired. The surface illuminator is operated through a separate transformer.

W. K. Millholland Boring Machine Is Built with Two Standard Units

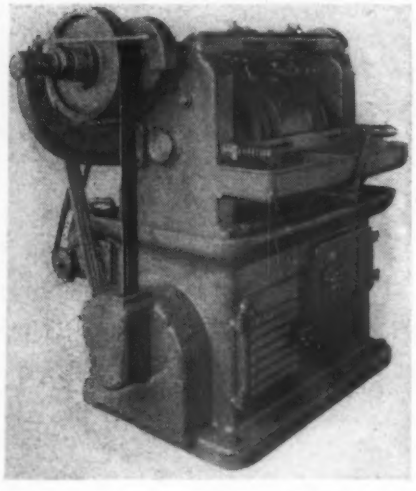


Standard cam-operated automatic units are used to build this double-end precision boring machine for a gear case and cover

Three bearing holes in a gear case and mating cover are rough and finish bored, counterbored, finish faced and chamfered in machine built by W. K. Millholland Machinery Co., 748 Fairfield Ave., Indianapolis 5, Ind.

Work is clamped in an air-operated fixture and cycle is started by a pushbutton. In the rough boring cycle the feed starts with a coarse feed and changes to fine feed for counterboring with a dwell for facing. As the roughing head returns to starting position, it starts the cycle for finishing. The gear cover is run over the same machine by changing tools and workholding fixture.

Sommer & Adams Drum-Type Miller Will Straddle Mill Four Parts

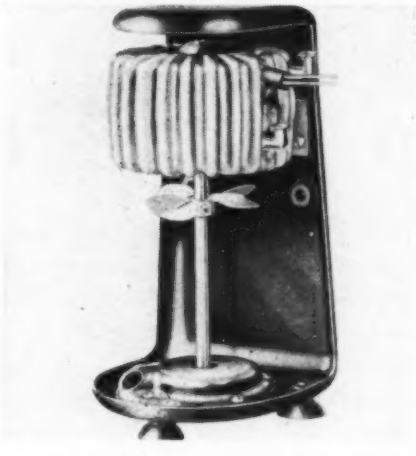


A drum-type milling machine which permits single or double milling on four parts is announced by Sommer and Adams Company, Cleveland 12, Ohio. The No. 3 Craftsman is designed for straddle milling, slotting, or facing on studs, nuts, bolts, pins, strips, and other work.

The drum rotating gear box mounted in the center of the frame consists of a worm and a worm wheel driven by a hardened and ground worm and tractor bronze wormgear. Pick-off gears are used to change the speed of rotation of the drum.

Work can be quickly loaded in the chuck and is automatically ejected after milling. The cutters are said to be easily accessible for adjustment or regrinding. A disk-type clutch is used to disengage the cutter spindles and drum.

Dan Morey Recirculating Pump Has Water Output of 2 GPM.



A recirculating pump for evaporative coolers, circulating coolants to machine tools or other uses, is announced by Dan Morey, 814-16 S. Robertson Blvd., Los Angeles 35, Calif.

The pump is 10 in. high with a shipping weight of 7 lb. It has a water output of 2 gpm. at 72-inch head.

The 1/50-hp. motor is enclosed in an aluminum case and cooled by an external fan. The stand is made from 16 gage steel and mounted on rubber vacuum feet for vibration dampening.

Cherry Blind Rivets of Monel Made for General-purpose Use

Blind rivets made of Monel have been added to the line of Cherry Rivet Co., 231 Winston St., Los Angeles 13, Calif. Monel has high strength, ductility, and excellent resistance to corrosion, which makes the rivet suited for general-purpose uses.

The Monel rivet is of the same construction as Cherry rivets of aluminum, bronze, and steel. It is made in self-plugging and pull-through hollow type, in modified brazier and 100° countersunk head style, and in diameters of ⅛, 5/32, 3/16, ¼, and 9/32 in.

UP TO 80% OF YOUR TURNING, FACING, AND BORING JOBS HANDLED BY

Style T-15
Style T-12
Style T-1
Style T-4 (Style T-7, left hand)
Style T-13 (Style T-14, left hand)
Style T-5 (Style T-9, left hand)
Style T-10 (Style T-11, left hand)

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Reduces Inventory of "Specials" —Permits Fast Tool-Up

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Carboloy "Standards" are stocked in quantity in 70 cities, coast-to-coast—making possible speedy delivery. By this service you avoid excessive delays, lost time, interrupted schedules. Moreover, these superior cutting tools are *actually priced lower than ordinary tools, in many sizes!* For complete data and specifications on all tools, write for Catalog GT-175R—sent to you without cost or obligation.

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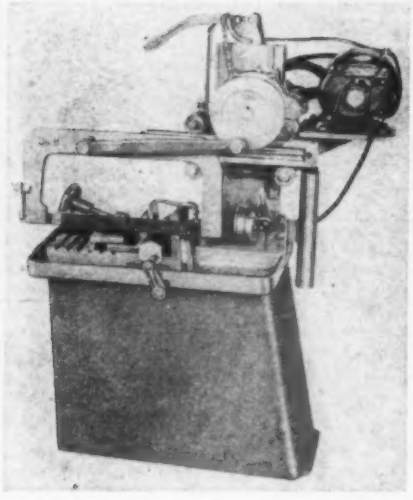
Stock up NOW on

Standard CARBOLOY* TOOLS

(TRADEMARK) CEMENTED CARBIDES

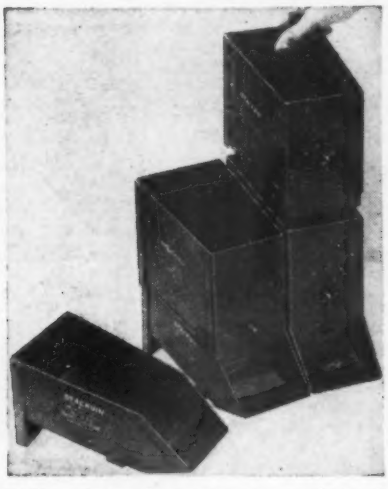
Standard Hi-Speed Hack Saw Made in Floor, Bench Models



Manufacturing rights to the Rodgers power hack saw have been taken over by the T & S Engineering Co., 15 N. Euclid Ave., Pasadena 1, Calif. The saw is now known as the Standard Hi-Speed power hack saw, and is produced in two models.

No. 3 floor model has a 6x6-in. capacity, 14-in. power blade, and is equipped with coolant pump and reservoir. The No. 2 bench model is a dry-cut saw, with 4x4-in. capacity, and a 12-in. blade.

Stackbin Sliding-Front Hopper Regulates Flow of Small Parts



Sliding-front hoppers to regulate the flow of small parts in assembly bins are announced by Stackbin Corporation, Providence, R. I. The slide is held in position by a wing nut and is easily adjusted.

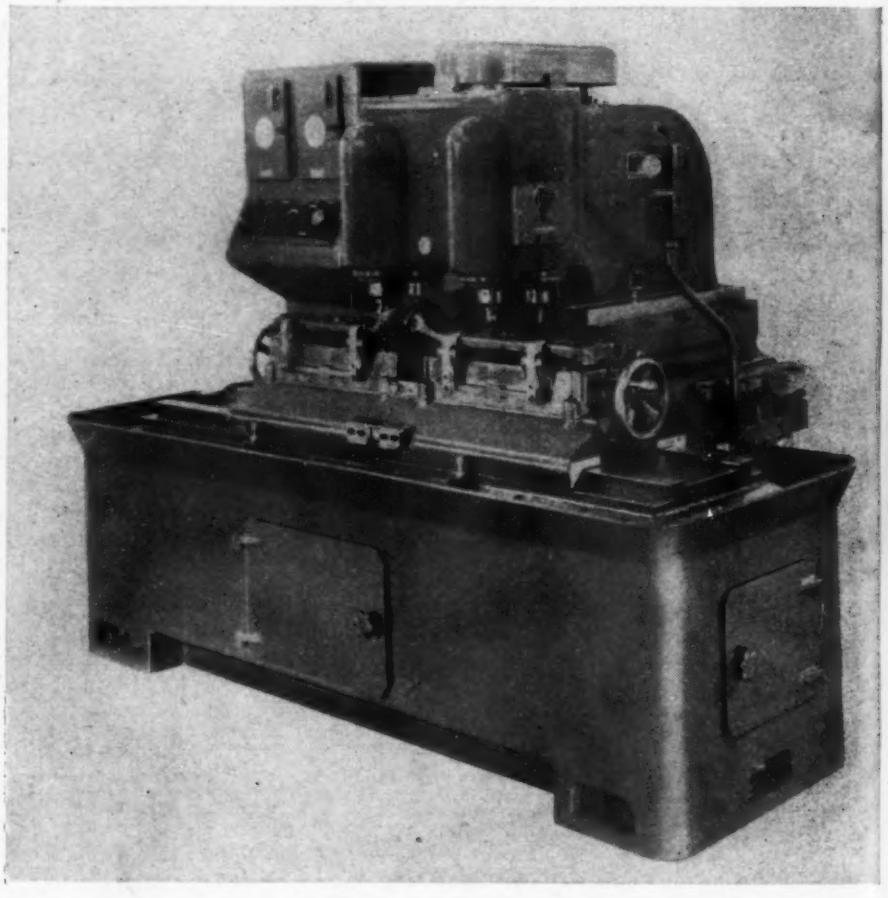
The adjustable hopper provides increased capacity for parts and regulates the flow according to size and weight. The hoppers are made of heavy gage sheet steel and are of welded construction. They are attached to bins without the use of nuts and bolts.

Kindt-Collins Master Cement Applies Cloth or Paper Disks

Master disk cement for applying cloth-backed and flexible paper disks to steel disk-grinding machines is announced by Kindt-Collins Co., 12651 Elmwood Ave., Cleveland 11, Ohio. The cement is not designed for heavy fiber-backed disks.

The cement is said to be both easy to apply and to remove, making it possible to replace worn disks in a few minutes. The cement is said to hold the abrasive disk tightly to the entire face of the metal disk, assuring grinding accuracy.

HEADREST SPECTACLE—For low temperature brazing or other applications where complete eye covering is not necessary, the LTB-50 Headrest Spectacle is made by Jackson Products, 3265 White St., Detroit 7, Mich. Weight is distributed over the entire head, rather than being concentrated on the nose and face. The spectacles can be raised to inspect the work or check equipment



SPECIAL MILLING MACHINE—A two-stage machine for milling the bosses of cylinder-head castings has been built by Hydraulic Machinery, Inc., 12825 Ford Road, Dearborn, Mich. With hydraulic operation and electric control, the machine has a production at 80% efficiency of 90 per hour. While the operator is unloading and loading the part in the station away from the work position, the milling head moves in machining the part at the work station. When the milling head retracts, the new part moves into the work station

VICKERS HYDRAULIC·CONTROL means *Greater Productivity and Versatility* FOR ETNA Tube Cutoff Machines

Important advantages of Vickers hydraulic controls that make for higher production rates and greater versatility are illustrated by this Etna Hydraulic Tube Cutoff Machine. Completely automatic is the cycle which feeds the tubing rapidly and accurately to length within a few thousandths, provides quick action clamping, cuts off and then unclamps the stock. Feeding and clamping rates are varied by simply turning a dial . . . there are no cams or gears to change. The rapid traverse approach of tool slides and the rapid return save time. The machine is compact and completely self-contained; it is changed from one diameter of tube to another in a few minutes.

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Quick, Accurate Readings...

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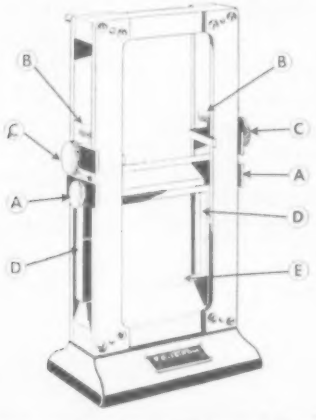
INTERNAL SETTING GAGE!

Set Your Internal Gages Quickly, Easily, Accurately!

Don't waste time with clamps and parallels in setting your internal instruments and gages! Use the ELLSTROM Internal Setting Gage! It's designed especially to give you faster, more accurate readings over a wide range of applications . . . on the job or in final inspection. In many cases it eliminates the need for master ring gages!



Made of finest steel . . . with all gaging surfaces processed and finished to millionths in flatness, the ELLSTROM Internal Setting Gage provides the ultimate in accuracy with minimum adjustments.

Available in two sizes . . . one with 6" range, the other with 10" range.

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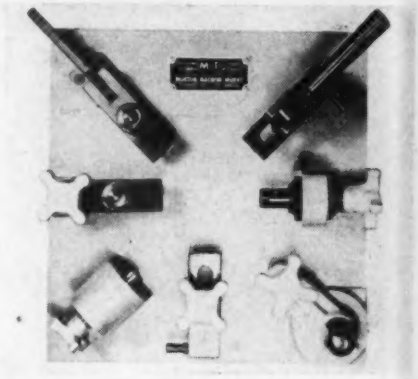
THE WORLD'S finest STANDARDS

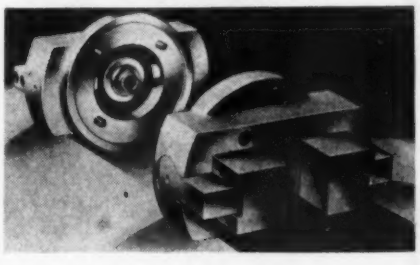
Morton Jig and Fixture Parts Use Heat-treated Alloy Steel



An improved line of jig and fixture components, each of which is available in a range of sizes, is announced by Morton Machine Works, 2422 Wolcott St., Ferndale 20, Mich. Parts are made of heat-treated alloy steel.

The lever unit shown in the upper left has a strap pin-connected to the cam lever and is slotted for back-up stud, so that it can be slipped back to clear the work when the lever is released. This unit is available in six sizes with the strap varying from ⅞ to 1¼ in.

Skinner's Box-body Chucks Suited to Irregular Work



Production has been resumed on the Series 1400 and 1400-A box-body chucks, self centering and power operated, which are produced by the Skinner Chuck Co., 344 Church St., New Britain, Conn. Production had been discontinued during the war.

The two-jaw chuck has soft jaws which are adapted to objects of irregular shape. Present production is in the 9-in. rated size only.

Acromark Printer Fills Letters With Suitable Ink or Enamel

Stamped size numbers can be filled with ink or enamel in the Acro Printer No. 600S made by the Acromark Co., 7-13 Morrell St., Elizabeth 4, N. J.

The ink or enamel is saturated into a special felt cut in the form of a ring and set in a brass cup-

Century Form J motors driving a battery of automatic screw machines where tolerances are often held to .00025".

CENTURY MOTORS'

Unusual Freedom From Vibration Helps You Produce Precision Parts With

CLOSER TOLERANCES

SMOOTHER SURFACES

FEWER REJECTS

Century motors are widely known for their ability to run smoothly and quietly — and with an unusual freedom from vibration. On machine tools this means that production parts, tools, dies, or fixtures are more accurate because vibration is not transmitted to the driven machine.

Precision built to match the precision of the machines they drive — Century motors stand up under the toughest kind of operating conditions. Rugged frames, accurately machined feet, accurately aligned bearings, and many other features contribute to their outstanding performance.

Engineered to the functional characteristics of the machines they drive to assure top performance — Century motors are a vital factor in producing a better product at a lower cost.

Century motors are available in AC or DC types and sizes from 1/20 to 600 horsepower. Specify Century motors on all your electrically powered equipment.

Century C MOTORS

460

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WHY PUSH WHEN YOU CAN CONVEY

Pushing material around is not only slow, hard work — it's costly material handling — there's an easy way to do it.

Investigate the use of conveyors. Conveyors handle a wide variety of parts, packages, units, cans, bottles, barrels, bundles, drums and boxes. Available in light, medium or heavy-duty types — portable or stationary — as systems, sections or units — power or gravity fed, they give you remarkable savings in time, money and manpower conservation. They relieve confusion and congestion.

Standard Conveyor Company has the experience and facilities to engineer, recommend and furnish the right type of conveyor for your particular needs.

Write today for catalog No. AM126 "Conveyors by Standard"—a ready reference on conveyor types and systems.

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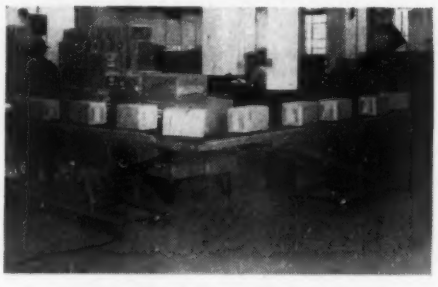
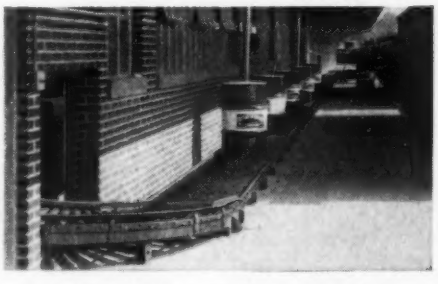
Sales & Service in Principal Cities

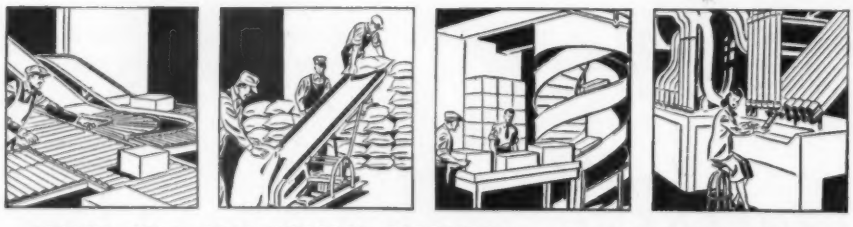
PRODUCTION LINES
Slat type conveyor used to speed assembly and crating of refrigerators.



STORAGE AREAS
Portable "Handibilt" conveyors used as a continuous conveyor line in storage area.



LOADING PLATFORM
Oil drums leave the warehouse for loading into boxcars on gravity roller system.



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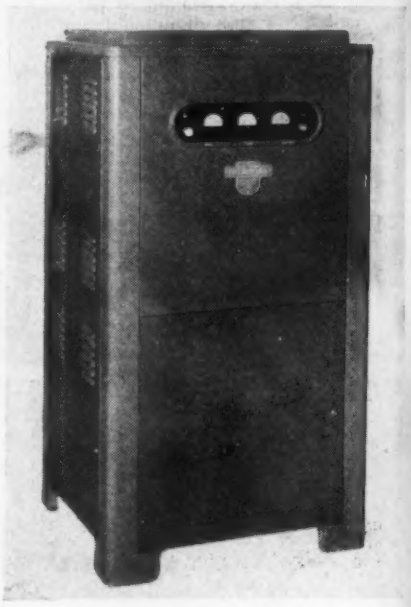
shaped form that can be rotated from a central axis to maintain a fresh supply of ink. The machine can also be used for printing size numbers on parts if stamping into the part is not necessary. The inks are available for aluminum, brass, steel, plastic and other materials.

Ther-Monic Combination Generator Is for Induction, Dielectric Use



A combination induction and dielectric heating generator, Ther-Monic M-285 C, has been developed by Induction Heating Corp., 389 Lafayette St., New York 3, N. Y.

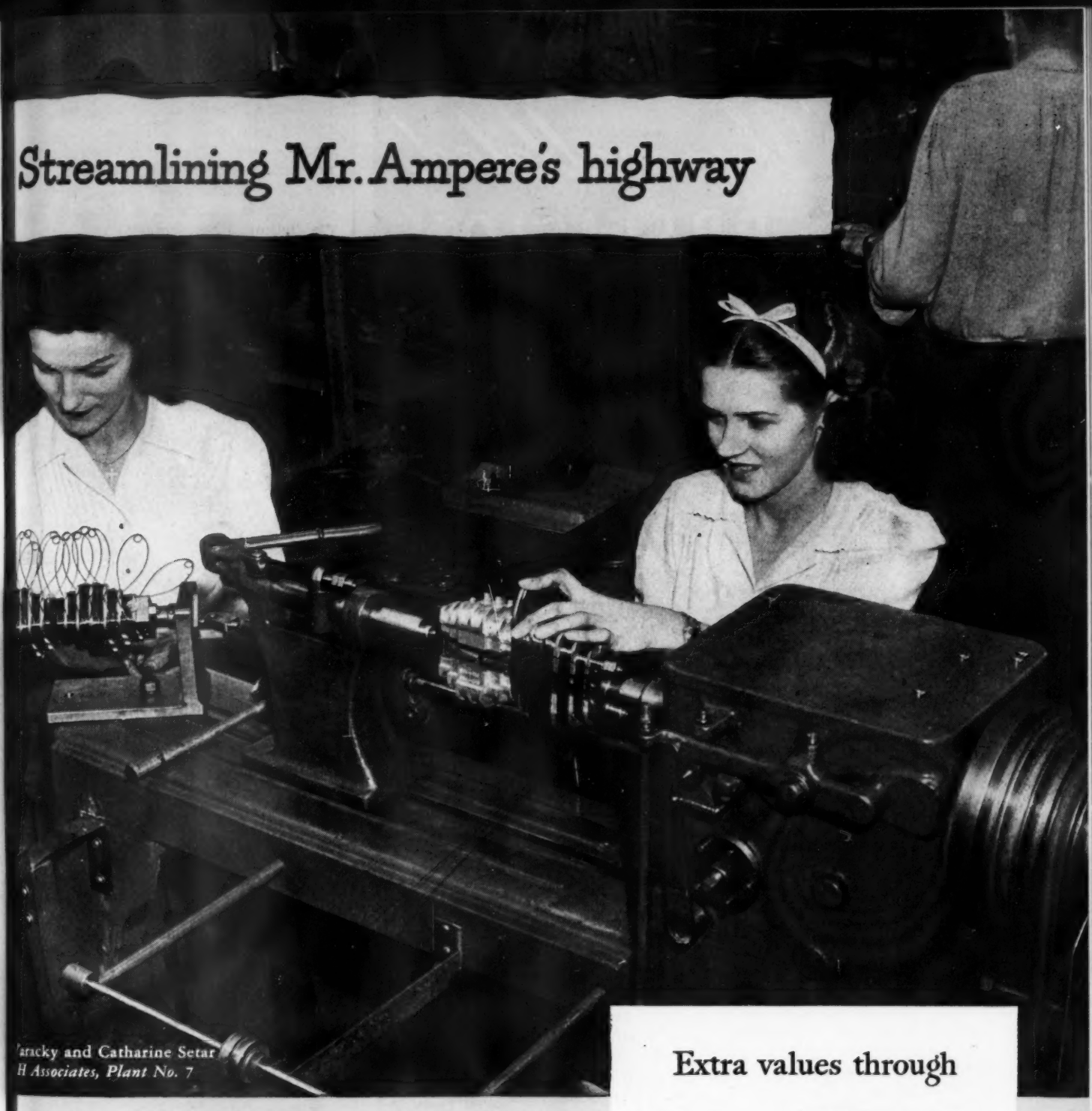
The generator has two separate, interchangeable oscillator sections, one for induction and one for dielectric heating. The induction oscillator feeds into a radial-frequency output transformer. It can easily be removed and replaced with the dielectric oscillator which feeds through coaxial cables to heating electrodes.

The generator operates on 205 to 245 volts, 60 cycles, single-phase current. The full-load input is 12 kva. and output is 285 Btu. per min., or approximately 5 kw. at nominal frequencies of 375,000 cycles per sec. for induction heating and 20,000,000 cycles for dielectric heating.

Speed-Way's Locating Machine Uses Projection Magnification

A machine for locating and drilling which uses a projection magnification system, is produced by the Speed-Way Machine Co., 23 Harmon St., Worcester 8, Mass. The unit is supplied separately for use under a radial drill or equipped with drill-head for spotting, drilling, and tap-

Streamlining Mr. Ampere's highway



'aracky and Catharine Setar
H Associates, Plant No. 7

Extra values through

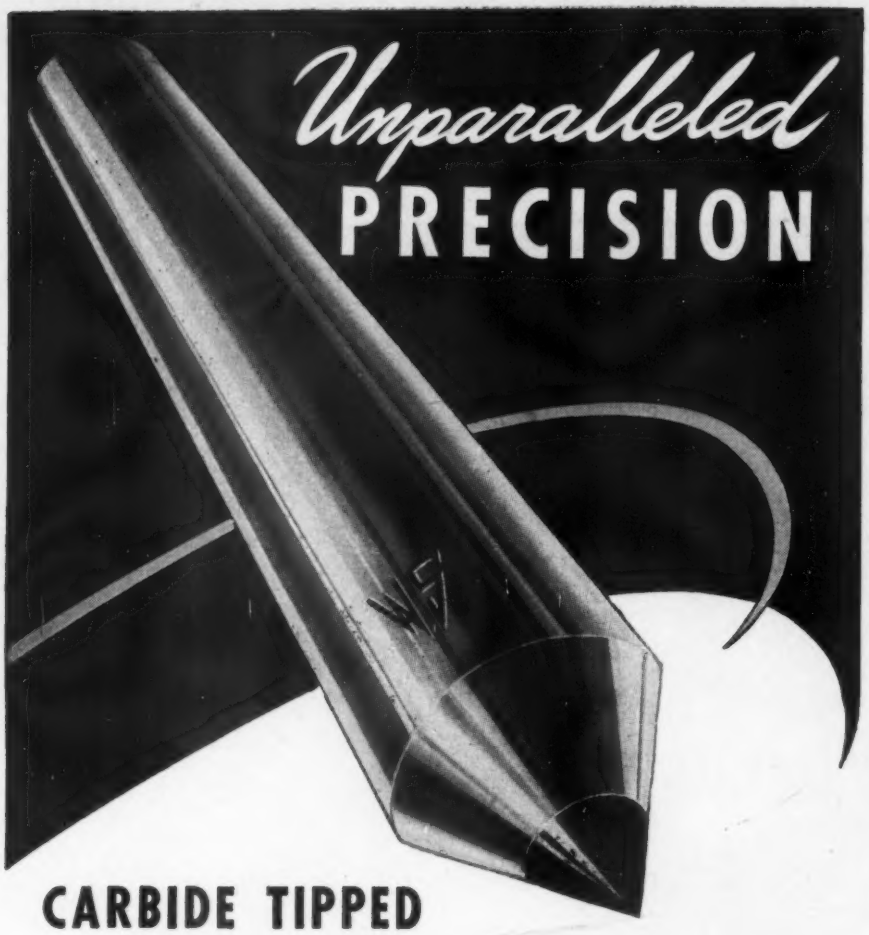
JACK & HEINTZ

Mass Precision

The Winding of an electric motor consists of many turns of copper wire which are wrapped around magnetic poles. In most fractional horsepower motors, these windings are made from as many as four sets of coils, spliced together. To eliminate these splicing operations, Jack & Heintz engineers developed an ingenious form by which an entire motor winding can be wound with one continuous wire. As a result, Jack & Heintz precision motors are flowing faster to a world that's yearning for new appliances.

By *mass precision* methods like this, Jack & Heintz is producing *extra values today* in motors, bearings, aircraft accessories, Eisemann magnetos and refrigeration compressors, and is developing other revolutionary products for *tomorrow*.

JACK & HEINTZ PRECISION INDUSTRIES, INC., *Cleveland 1, Ohio*



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CENTERS
For Longer Wear...Greater Accuracy

SAVE ON SET-UP, ADJUSTING and GRINDING TIME with these more *accurate* W-S Lathe Centers. Their concentricity is *guaranteed* to within .0002" or less! Made by entirely different method of manufacturing, W-S Centers help assure the highest degree of precision work from your machine tools. Carbide tips reduce friction and give a cooler, more perfect bearing. The craftsmanship inherent with all W-S Centers goes far beyond the point of visual inspection. However, it *is* evidenced in their ability to maintain greater accuracy while outlasting from 10 to 60 ordinary centers. Carbide tipped tools are not just a specialty with us . . . we make them *exclusively*. Most sizes available from stock. Write for Free Catalog 646 and latest prices. WENDT-SONIS CO., Hannibal, Missouri and 580 North Prairie Avenue, Hawthorne, Calif.

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CARBIDE TIPPED CUTTING TOOLS
BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS • DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS • ROLLER TURNING TOOLS • SPECIAL BITS

ping. It can be adapted to inspection work.

The Speed-Way has a capacity for work within a range of 12 x 12 in. It has a fabricated sheet steel base and cast-iron tables mounted on grease-sealed bearings to allow free movement in any direction.

American Optical Face Shield Has Cellulose Acetate Window

A face shield for over-all protection has been developed by American Optical Co., Southbridge, Mass. The window is 18¾ x 10 in., of cellulose acetate 0.04 in. thick. The window extends completely around the face, covering the ears, and is attached to a fiber headguard which protects the upper forehead and top of the head. Friction joints hold the window.

Gaging WITHOUT CONTACT

At a Speed as Fast as Light!

Hot sheets or strips of metal or foil flying from the rolls; paper emerging in a never-ending sheet; or the plastic or rubber blanket flowing from a calender, may be checked instantly for thickness, and this thickness controlled during the process by the Sheffield Measuray.

Temperature of the material to be checked and its speed of movement do not affect the accuracy of the thickness check. Proximity of gaging head to material is not important—it can be as much as a foot or more distant, depending upon the application. Amplification and sensitivity are available in excess of any known industrial requirements without sacrifice in speed, range, or dependability. For instance, it is possible to amplify one per cent of the thickness of the stock being checked to extend over the full scale range.

The Measuray may be mounted on a production machine, or it may be used at the bench to measure stationary objects, especially those whose surfaces might be marred by a contact gage, or those of such resiliency that the contact gage measurements are not practicable.

See the Measuray demonstrated at the Sheffield plant in Dayton. Bring samples of work to be checked to see for yourself the savings in material and time, elimination of losses in destructive testing, and the increase in uniform quality which the Sheffield Measuray can bring you.

If a visit is not convenient, write us for detailed information. For an early installation, ask for a survey to be made in your plant by Sheffield engineers—no obligation on your part.

Write to Department B

Real job security is only provided by plentiful incoming orders shipped at prices consumers can afford and want to pay . . . modern machine tools help make this possible.

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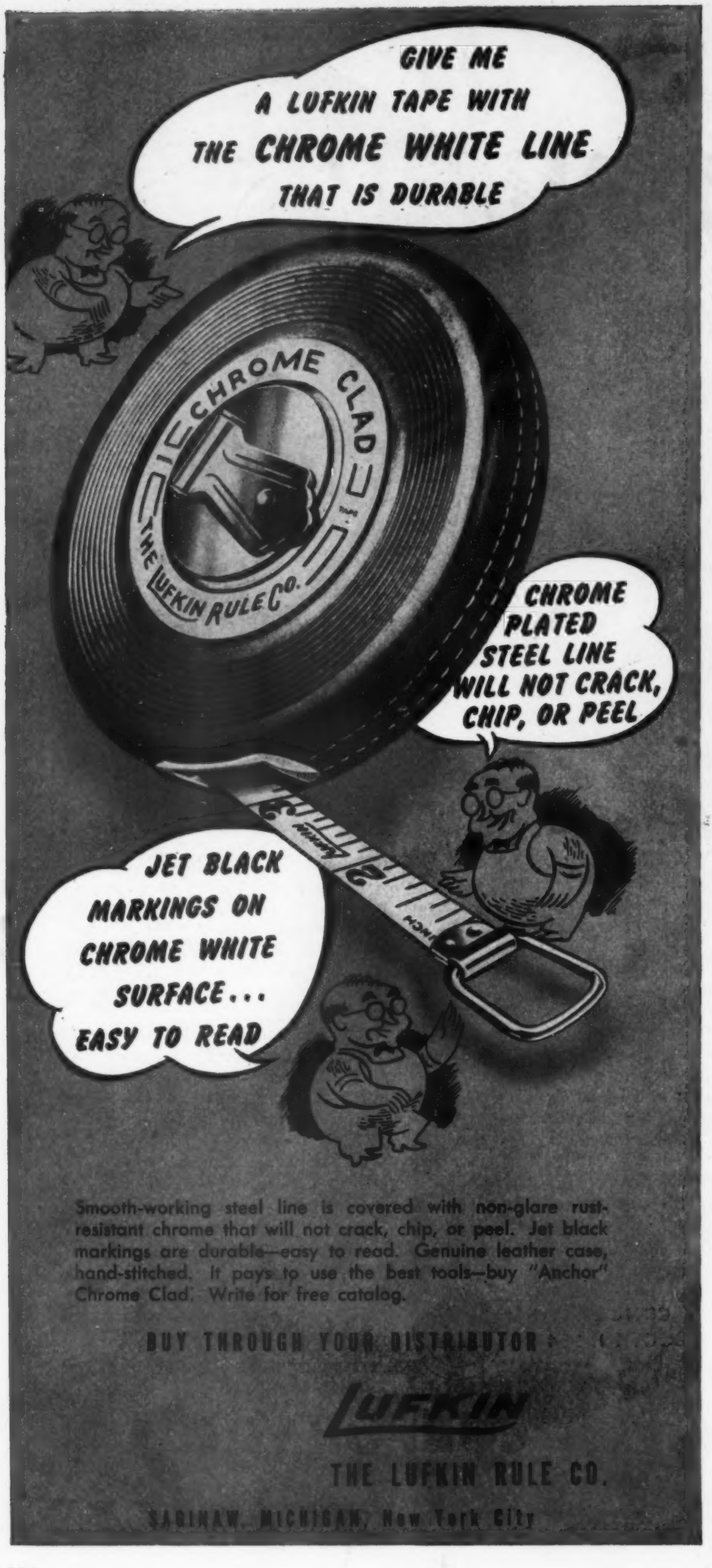
GIVE ME
A LUFKIN TAPE WITH
THE CHROME WHITE LINE
THAT IS DURABLE
CHROME CLAD
THE LUFKIN RULE CO.
CHROME
PLATED
STEEL LINE
WILL NOT CRACK,
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EASY TO READ
Smooth-working steel line is covered with non-glare rust-resistant chrome that will not crack, chip, or peel. Jet black markings are durable—easy to read. Genuine leather case, hand-stitched. It pays to use the best tools—buy "Anchor" Chrome Clad. Write for free catalog.
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THE LUFKIN RULE CO.
SAGINAW, MICHIGAN New York City

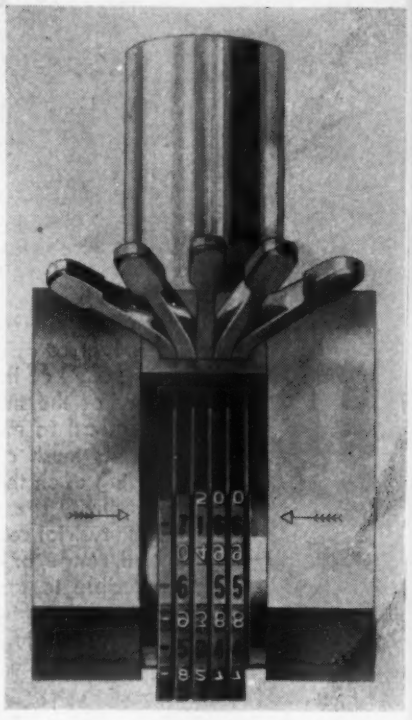
Interstate Sales' Protractor Made with Magnesium Frame

A "center finder" protractor with a magnesium frame is announced by Interstate Sales Co., 1121 Broadway, New York 10, N. Y. The complete tool weighs only 10 oz.

The retractable center-punch slides freely in the frame. One side of the tool has a double-reading degree scale, with two frame witness marks, allowing it to be used as a 360 deg. protractor.

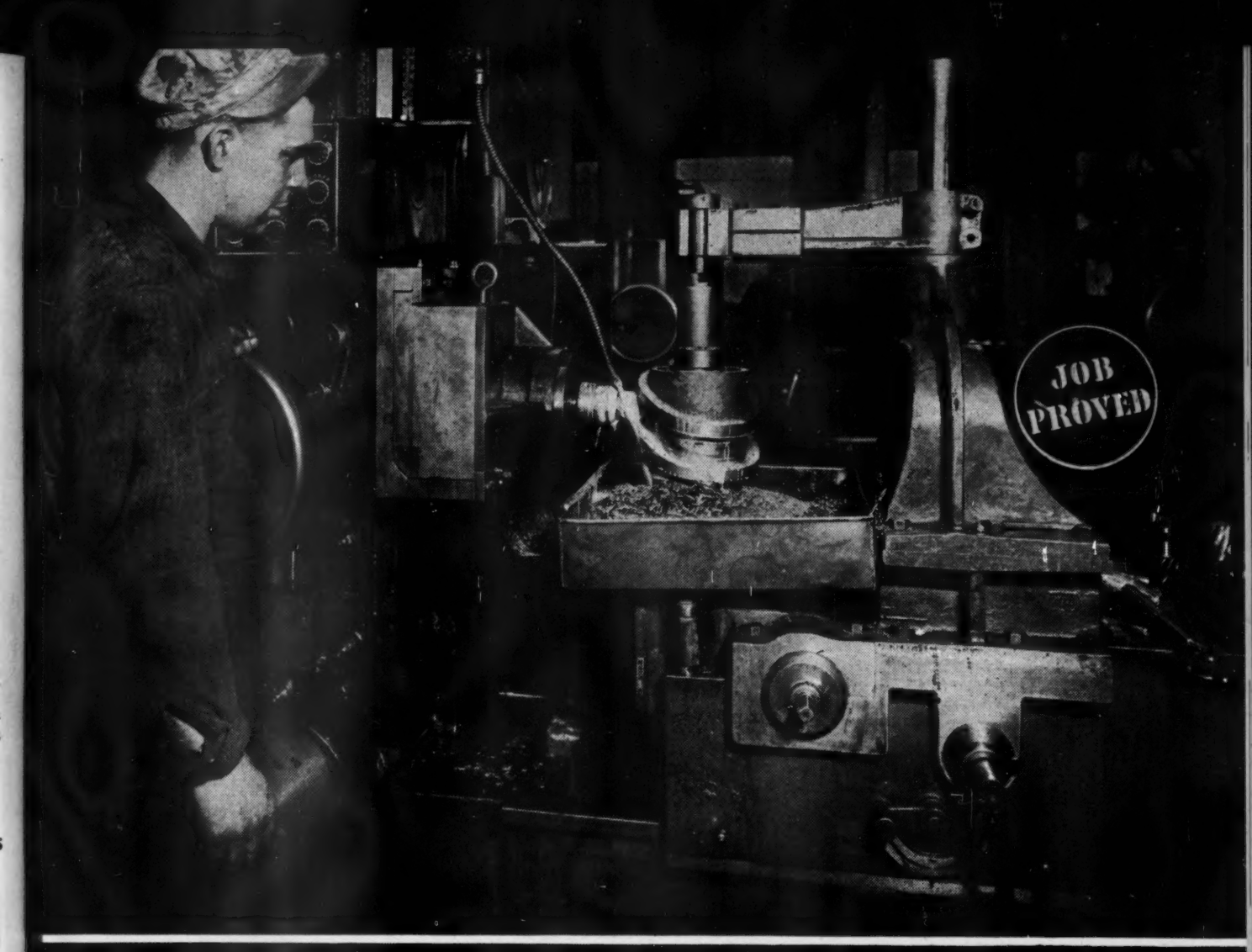
The other side has a nest of 4 levels, rotating in conjunction with the dial and registering with the V and flat side of the frame. This can be used to mark 4 equi-distant points on the circumference of the pipe.

William Force Numbering Head Has Individual Wheel Controls



A selective-type numbering head for stamping metal parts, Model 27, is announced by William A. Force, 216 Nichols Ave., Brooklyn 8, N. Y.

Instead of automatic consecutive action, each wheel is controlled by an individual lever, so that any desired number can be set. The wheels are indexed for direct reading when in the printing position.



CUTTER LIFE DOUBLED . . . *Costs cut* 25%

SUNOCO EMULSIFYING CUTTING OIL

Used for Milling Cams, Eliminates Stains and Odor, Produces Better Finish

A well-known machine-tool builder, in the cam-milling operation shown above, was not obtaining satisfactory finish. The cutting emulsion had an objectionable odor and had to be changed every two weeks.

Lubrication costs were cut 25% when they changed to Sunoco Emulsifying Cutting Oil for both milling and grinding. The new oil lasts more than four times as long. Cutter life has doubled. Finish has improved. Objectionable odor eliminated.

The facts: Machine: Rowbottom cam miller
Operation: Milling cams
Material: Air-cooled alloy steel casting
Depth of cut: 1/8"
Tool: High-speed Weldon end mill
Cutting Lubricant: 1 part Sunoco to 15 parts water

In hundreds of shops Sunoco Emulsifying Cutting Oil has been "Job-Proved." It mixes easily with water. Its high cooling and lubricating qualities are important wherever ferrous or non-ferrous materials must be cut with precision and at high speed.

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it's easy to pick the right wiper!

Try the blindfold test on KEX Industrial Wiping Towels and ordinary rags or waste. Just by touch, choose the wiper *you* would use.

Feel how rough and scratchy the ordinary rags and waste are. What a lot of damage *they'd* do on delicate surfaces! Now pick up a KEX Wiping Towel. Easy to tell the difference, isn't it? Feel that springy KEX s-o-f-t-n-e-s-s. No scratching, no possibility of wearing grooves in soft metal by foreign matter.

That's not all, though. Every square inch of a KEX Wiping Towel is *wiping* surface . . . hundreds of more wipes per pound over ordinary waste or rags. KEX Industrial Wiping Towels are uniform in size—distribution is easier to control. And fresh KEX Wiping Towels—chemically cleaned by a *special* high-heat process—are delivered to your plant as often as needed. Always plenty of clean KEX Wiping Towels on hand.

Rent KEX Wiping Towels and Figure Your Profits

Try the KEX Wiping Towel Rental System, today. There's nothing to buy, no expensive inventory—just a low monthly rental. And the very first month should show considerable saving on wiping costs. For complete information, phone your local KEX representative—or write KEX National Service, 295 Fifth Ave., New York 16, N.Y.

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ROUND TABLE *Discussion*

SHOULD A MAN OWN HIS OWN TOOLS?

The characteristics of present-day toolmakers and machinists have not changed much from those of days gone by. Aside from the fact that a certain amount of specialization is being practiced in certain types of industry, the mechanics of today are still artisans who exercise a great deal of pride in having a personal kit of tools essential for their work.

The majority of our skilled craftsmen are endowed with a sense of responsibility, they fully realize that faulty personal tools will not be accepted as an excuse for faulty workmanship. Furthermore we must take into consideration the fact that skilled men inherit a degree of confidence when handling tools of their own, and this enables them to eliminate the element of caution and uncertainty when at work on an assigned task.

Because of the nature of their work, machinists and toolmakers are inclined to possess temperamental characteristics. In view of this it would be difficult for a company to provide a suitable well-rounded kit of tools for every man. Assuming that an organization approached the tool problem by maintaining a well-stocked crib of so-called personal tools, this still would be an unsatisfactory solution. There would be considerable wasted time by skilled men because of the number of trips which would have to be made to the crib for an immediate tool need instead of being able to pull open a chest drawer and pick up the desired tool at the moment it is needed.

It is desirable practice for plants to furnish measuring instruments used for measurements over 3 in. because the majority of mechanics feel they do not use such tools frequently enough to justify purchasing them for their own personal kits.

Peter L. Budwitz
Meriden, Conn.

•

Regarding some of the questions raised over owning your tools, here is my answer from an experience covering the years back to 1899: I think a man should own a reasonable number of his own tools. A machinist should at least carry a 1-in. mike among his equipment. Tool-and-die-makers should carry 1-

INSIST ON haskins QUALITY

Haskins Flexible Shaft Machines meet the demands of modern competition. They are *quality* machines—built of quality material by men of experience, experts in their line. The flexible core, made of special Swedish music wire—the heavy duty rubber fabric casing—the removable casing ends—the ball bearing grease-sealed spindle—the amply-powered motor—these are outstanding features.

And there are literally hundreds of specific operations for these portable tools . . . grinding, drum and disc sanding, rotary filing, wire brushing, buffing and polishing. But whatever the job, a Haskins will do it better—speedily and economically, yet carefully and accurately, too. Send for details.

HS-4, ½ h.p. multi-speed, countershaft unit, 1800 to 7200 R.P.M., mounted bench height on caster base, 360° swivel.

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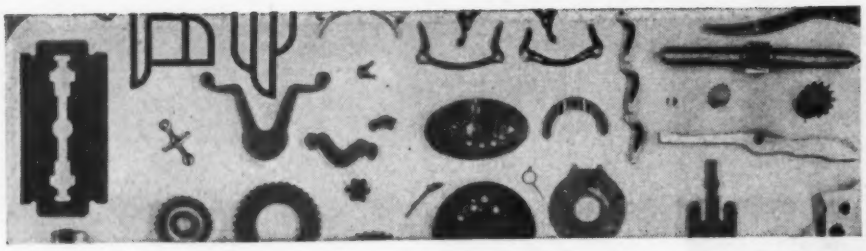
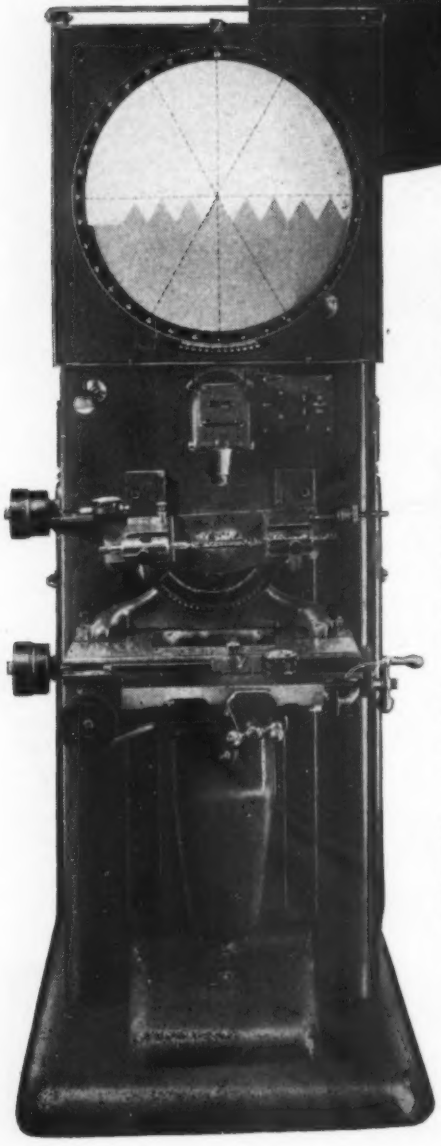
FLEXIBLE SHAFT EQUIPMENT



Lower Inspecting and Measuring Costs On Parts Like These . . .

With the

Bausch & Lomb CONTOUR MEASURING PROJECTOR



How do you measure, compare, and inspect machine parts? Have you checked your present methods with the advantages of the Bausch & Lomb Contour Measuring Projector?

This versatile, precise, optical instrument provides a modern method that is simple, economical, and fast. It projects a sharp, distinct, geometrically true, magnified silhouette of the object. Dimensions, angles, and profiles may be compared directly with a large scale drawing superimposed on a plain screen. By utilizing a protractor screen, all angular measurements can be made to ±1 minute of arc (1′)—an accuracy not available with any other projector. Also, direct measurements, accurate to ± .0001″, may be made by means of the cross slide stage with its attachments.

Many manufacturers are using the Bausch & Lomb Contour Measuring Projector to make more precise products in less time, at lower cost. Write for Catalog D-27. Bausch & Lomb Optical Co., 618-12 St. Paul St., Rochester 2, N. Y.

BAUSCH & LOMB

ESTABLISHED 1853

2- and 3-in. outside mikes, depth mikes, inside mikes, vernier protractor and sine-bar as well as a good indicator.

I think, however, most shops today should have their own sets of mikes, sine-bar, and Jo blocks, height-gage and all scales over 12 in. when necessary. To discourage theft of more expensive tools, I think the makers should give them a serial number and letter. This would eliminate personal identification stamping which often spoils some tools. In case of theft, a tool could be traced like a watch.

Henry Rasmussen
Niagara Falls, N. Y.

•

It is a difficult matter to decide just what measuring and testing tools an employer should own and what the employee should furnish to produce the best results in all cases because much depends on the type of work being done and also on the type of men employed.

From my experience, it would seem best as a general rule for the employer to furnish practically all of the working tools required, such as the required cutting and handling tools, together with the special gages and fixtures. The operators should furnish, however, the major part of the measuring tools required.

These decisions were arrived at by results obtained in several shops doing a variety of work ranging from quite small to large in what is often termed "jobbing-shop" work, also in manufacturing shops on both small and large production lines. The precision required was about average.

The workman who owns most of the tools needed for his work can usually be depended upon to know how to use them to the best advantage and how to preserve them for long and accurate service.

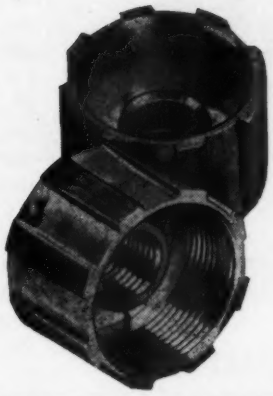
On the other hand, the man who works mostly with his employer's tools often does not develop care in handling them. There is pride in ownership that nothing else will offset.

John Mark May
Watervliet, N. Y.

•

DOES THE ROLLING STONE GATHER POLISH?

Al is right. The rolling-stone mechanic is a good man to have—an all-around man who can do almost everything. By moving from place to place he picks up different ways of doing a job; the man who sticks



9 seconds

TAPPING TIME: 18 SECONDS

Die-cast aluminum pistons of pop[illegible] Gabriel Aerotype Shock Absorbers have two concentric tapped holes. One, in the skirt, is 1" diam., 20 pitch, to receive the piston head. The other, 7/16" diam., also 20 pitch, receives the shaft. Tapping time, using two machines with cross-slide feed, was 9 seconds for each hole—18 seconds per piece.

Cost-wise Gabriel production executives reasoned that, if the two holes could be tapped simultaneously, tapping time would be cut in half. Ingeniously, they bored out the center of the larger tap and fitted the smaller one into it, producing a tool to do the job.

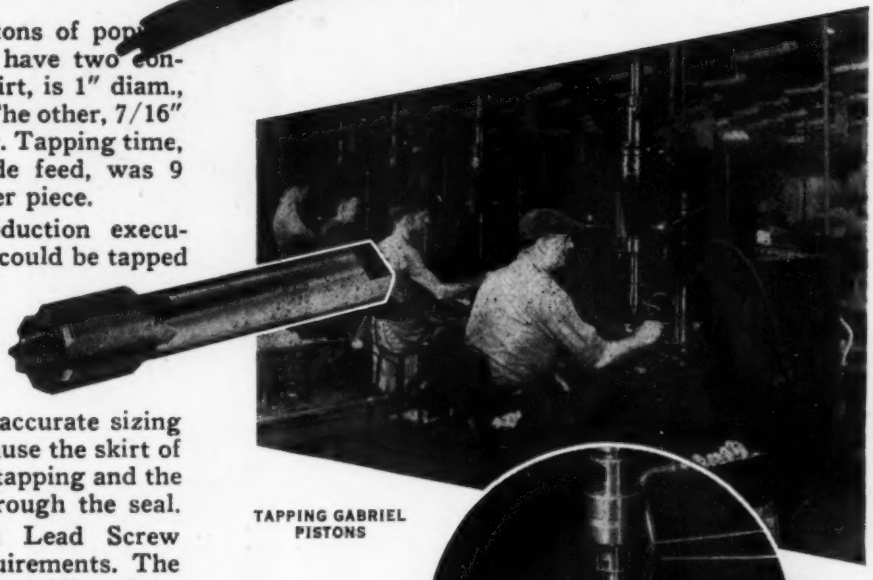
But perfect alignment, accurate sizing and correct depth were essential because the skirt of the piston is only 3/32" thick before tapping and the shaft must be precisely centered through the seal.

Fortunately, Cleveland Lead Screw Tapping machines meet all these requirements. The hardened and ground lead-screw feed, rigidity of the spindle and precise depth control provide the accuracy needed for the job. So today, Gabriel has a battery of four Clevelands with cross-slide feeds tapping both holes simultaneously. Tapping time per piece has been reduced to 9 seconds.

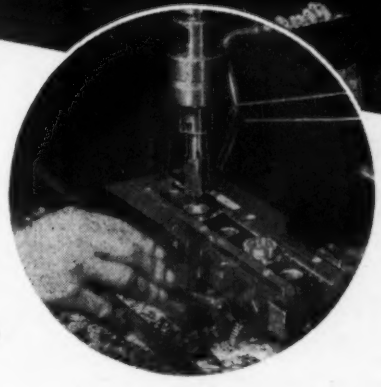
Rejects are negligible and the Cleveland's enclosed coolant system under the operator's control assures maximum tap life.

Scores of Cleveland Tapping Machine users are enjoying similar tapping economies—even on Class 3 and 4 fits on a production basis.

If your product must be drilled or tapped . . . one hole or a dozen . . . Cleveland engineers can probably show you how to speed production and cut costs. Send blueprints and specifications or sample parts to The Cleveland Tapping Machine Company, Hartville, Ohio.



TAPPING GABRIEL PISTONS



CROSS-SLIDE FEED

CLEVELAND *lead screw* **tapping machines**

Your copy is ready

The new, enlarged edition of the popular "Production Tapping Guide" has 24 pages of valuable data for use of the estimator, set-up man and operator.

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The Cleveland Tapping Machine Co. Hartville, Ohio

Send a copy of the Production Tapping Guide to

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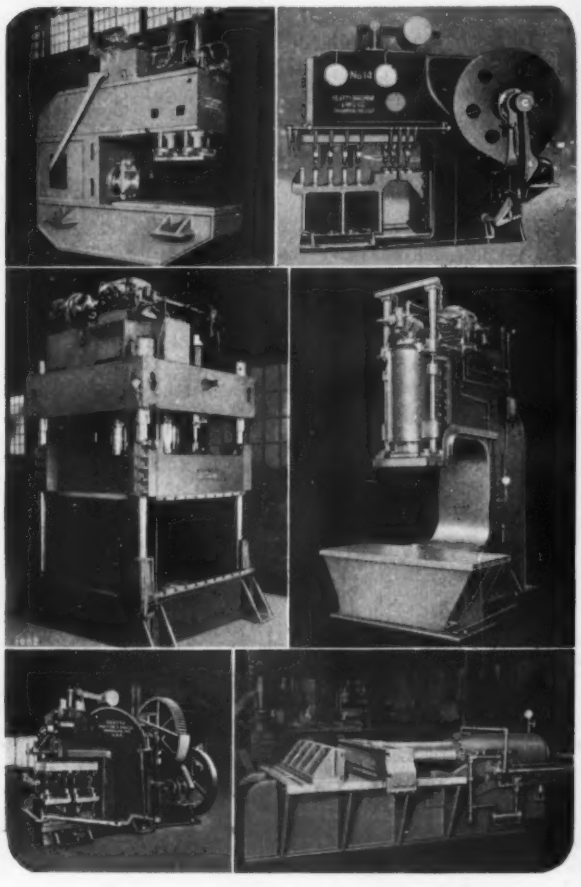
THROUGHOUT the heavy metal working industry BEATTY designed equipment is bringing greater speed, greater accuracy and lower costs to all basic operations. It's the engineering *behind* a BEATTY machine that puts that machine out in *front*. Let us know *your* problem.



BENDING
BLANKING
BULLDOZING
COPING
EXTRUDING
FLANGING
FORMING
JOGGLING
PUNCHING Structural Plate
SHEARING
SHAPING
STRAIGHTENING
PERFORATING

BEATTY MACHINE AND MFG. COMPANY
HAMMOND, INDIANA

in one place usually does a job in the one way used in the particular shop.

Let's illustrate: A pulley must be bored—usually a lathe job and one that will stump the ordinary mechanic in a shop without a lathe large enough. But the rolling stone will use a boring mill or a drillpress—or even improvise other ways to do it, based on his varied experience.

The rover is a conscientious worker and likes his job. He also likes variety, so moves on to pick up new things, new ideas, new knowledge. Being a rolling stone teaches him to work with all kinds of men. He is a good mixer and can get along alone or with a gang—while the worker who sticks to one job often cannot.

Al is right too in raising the rolling stone's wages to keep him. He will not have any trouble from the rolling stone as he does from some of his long-term employees who become prima donnas who think that their long experience in the shop gives them a right to refuse jobs they consider beneath their dignity or ticklish ones they haven't done before. The first kind they will try to pass off to their juniors; the second they try to pass the buck on because they don't want to admit they don't know what it's all about. The rolling stone will usually tackle anything; if he doesn't know how to do it, he isn't ashamed to say so.

The rolling stone is also an independent individual who will not take bullying from anybody. He will do what is expected of him and will show respect for other men who know their jobs. He also expects the other men to do the same, and will not tolerate unfair dealings from anybody, including his boss.

If his boss gives him a job—and admits he doesn't know how to do it himself—the rolling stone will do all he can to help; but if the boss doesn't know how to do it and tries to bluff, the rolling stone will find out sooner or later—and won't like it. That's when he leaves.

To keep a rolling stone on the job, give him plenty of difficult jobs, be fair to him, and see that the men are fair—then the rolling stone will roll no more.

Michael Axler
Bronx, N. Y.

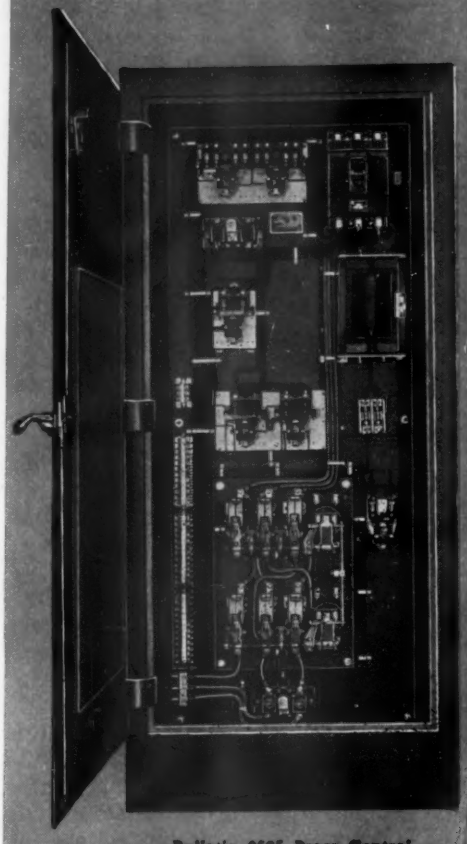
•

HERE are descriptions of a few typical individuals who have come under my observations.

One whom we will call Tom was a well-trained and capable young man who worked at two different

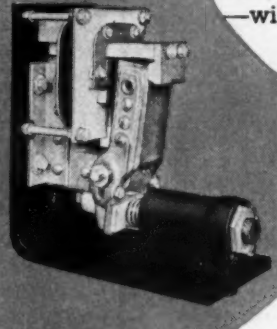
FOR SAFETY'S SAKE

. . . Use "3C" Press Control to take the hazards out of Power Press Operations



Bulletin 9505 Press Control

Master Panel



Bulletin 5735 Magnetic Air Valve (Cover Removed)

Fourteen years of development effort in cooperation with power press shop Engineers produced Clark Patented Anti-Repeat Press Control. Its exclusive safety features and operating advantages give maximum protection to both operator and press, and also aid in maintaining production.

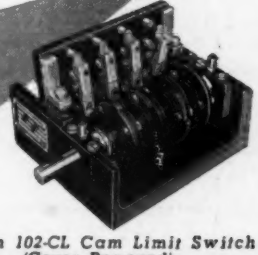
"3C" Bulletin 9505 Complete Press Control equipment is used with all types of power driven presses such as the air operated friction clutch and brake, direct drive, hydraulic and special types. It combines heavy duty devices—selected for their safety features and long operating life—into a smooth-working, low maintenance engineered function.

Here are some typical safety features of "3C" Press Control:

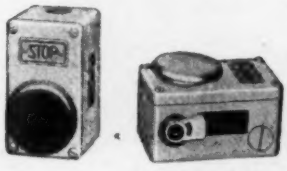
- **Anti-Repeat circuit design prevents false operation of press due to short circuits or grounds. No danger of second stroke while operator removes the completed piece.**
- **Proper interlocking, complete factory wiring, then unit testing.**
- **Tamper-proof, oil-tight, short stroke, palm operated push buttons.**
- **Selector Switch and "Run" Push Button equipped with cylinder locks to prevent tampering.**
- **Magnet air valve—designed expressly for press control work—provides protection against sticking open.**
- **Special non-freezing silver alloy contacts in press circuit.**
- **One enclosure houses circuit breaker, motor starters and press control.**

Clark Anti-Repeat Press Control gives not only the vital safety features listed above, but helps maintain high press production as well. A Clark representative—there's one near you—will gladly consult with you on any press control problem.

Ask for fully descriptive Bulletin 9505.



Bulletin 102-CL Cam Limit Switch (Cover Removed)



Bulletin 100 Type C Stop and Run Push Buttons

THE CLARK CONTROLLER CO.

1146 EAST 152nd ST., CLEVELAND 10, OHIO • EVERYTHING UNDER CONTROL

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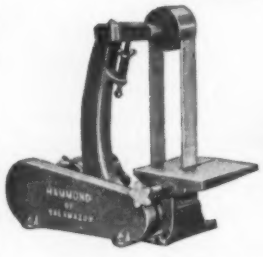
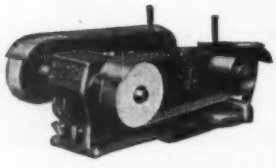
Abrasive Belt
GRINDER-POLISHERS

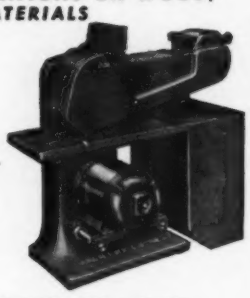
FOR FASTER GRINDING AND FINISHING OPERATIONS ON WOOD, METAL, PLASTICS AND OTHER MATERIALS



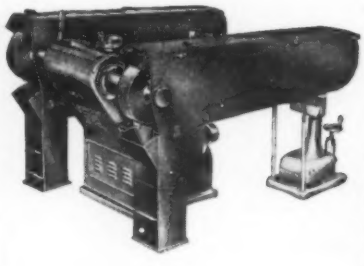
MODEL F-2 FLEXIBLE BELT — Especially suited for irregular shaped parts, eliminates costly hand filing.



MODEL NO. 5 DRI ONLY—UP TO 3" BELTS A popular hi-production grinding, polishing, buffing, deburring and brushing machine.

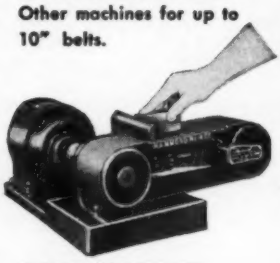


MODEL VH-6 WET-n-DRI, 6" BELTS — Vertical or Horizontal position. Other machines for up to 10" belts.



VARIABLE SPEED LATHE AND BACKSTANDS

Any speed from 1500 to 3000 RPM. Backstands can be purchased separately.



MODEL "400" WET-n-DRI, 4" BELTS Vertical or horizontal position. A popular belt grinder for finishing operations.

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10" WET and DRY CARBIDE TOOL GRINDER

No Spray — No Splash Guards, Safety Cup discs and heavy construction for fast, efficient grinding.

CARBIDE TOOL AND FINISHING GRINDER MODEL 7

For rough and finishing small tools and diamond wheel finishing of all size tools.

HAMMOND PRODUCTS — CARBIDE, GENERAL PURPOSE & ABRASIVE BELT GRINDERS • AUTOMATIC & CYLINDRICAL FINISHERS • POLISHING LATHES

Hammond Machinery Builders INC

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times for the company. He was enthusiastic about his job during his stay of several months each time. Then the grass looked greener in other fields and he went out to find out.

Dick was an excellent mechanic whose exceptional skill held him in the service of the firm until he was one of the oldest employees, in spite of the fact that he was a heavy drinker weekends and was most always irritable and grouchy on Mondays.

Harry was a man of about thirty years who gave excellent service on a good class of work. He sought another job after about three years of service, stating that this was the longest employment he had ever had in one place.

Jack was probably one of the most capable all-around machinists in the shop, remained with the Company for many years, and left only when he was offered an executive position with a much better salary with another concern in another line of business.

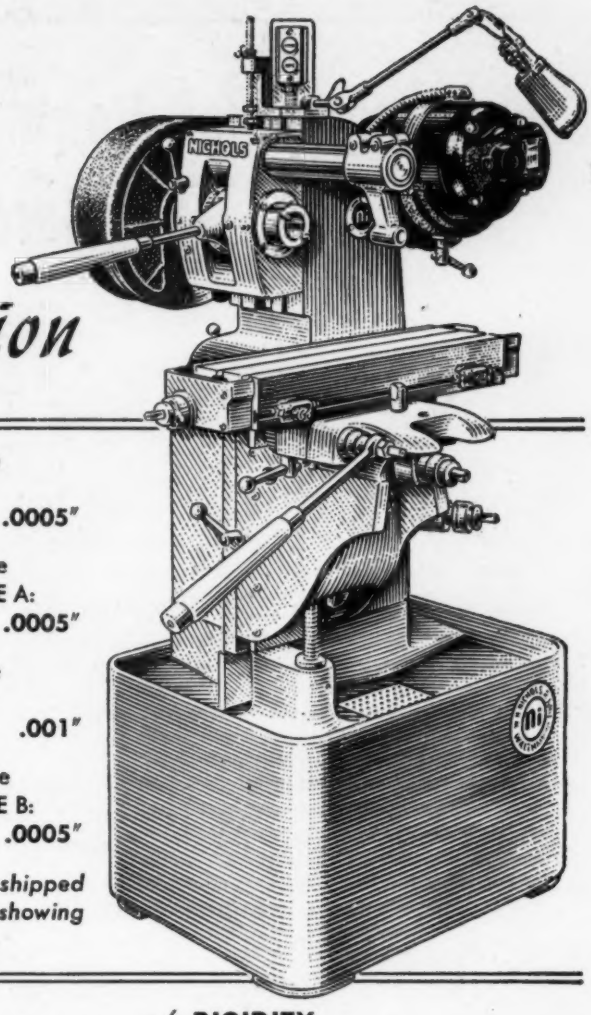
Jock, a steady and conscientious worker with unusual capacity, was employed for perhaps 25 years, until he was forced to retire on account of ill health.

John came in looking for a job, saying that he had worked in the eastern states, the Mississippi Valley and California as well as in two European countries. Although the class of work he reported was of high grade, he probably would not have been employed if his call had not occured at a time when help was very much needed. (The general manager of the shop didn't have very much use for rolling stones.) However, it was decided to give him a trial in the emergency. This proved to be a fortunate move. What really happened at this time was that he soon became acquainted with a young lady whom he married a little later. He settled down to a steady life and remained with the firm for upwards of twenty years.

Pete, also a man of the rolling-stone type, was a weekend drinker, who was finally warned that if he continued being absent on Mondays his services would no longer be required. He came in on the following Monday morning with a forlorn appearance, picked up his shop cap, placed it on his head lightly, then removed it carefully as though there must be something wrong about it. Thereupon a shop mate remarked to him, "Pete, that cap won't fit your head 'til about Wednesday!"

Bob, an exceptionally skilled mechanic on small work, was employed

Puts the PRECISE *in Precision*



Spindle Taper Runout: Allowable Error	.00015″
Spindle Runout on 8″ Mandrel: Allowable Error	.001″ F.I.R.
Parallelism of Spindle to Table: With Error at Spindle Nose	.0000″
Allowable Error 8″ from Spindle Nose	—.0005″
Parallelism of Spindle to Top of Knee: Allowable Error	.001″
Right Angularity of Table to Spindle on 20″ TRAM: Allowable Error	.001″
Squareness of Head Slide to Top of Knee: Allowable Error	.0005″
Parallelism of Head & Knee Slides on Column, PLANE A: Allowable Error	.0005″
Squareness of Head Slide to Top of Saddle: Allowable Error	.001″
Parallelism of Head & Knee Slides on Column, PLANE B: Allowable Error	.0005″

Every Nichols Miller is shipped with an inspection sheet showing these tolerances or better.

Everything about the Nichols Miller has been done to make it as precise as precision can be. Built-in Accuracy . . . Rigidity . . . Speed — all are there ready to give you speed with precision on a single piece or in mass quantity — with Versatility limited only by the imagination of the tool engineer or the capacity of the machine itself.

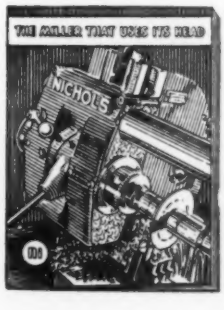
CONDENSED SPECIFICATIONS

Table Working Surface	6¾″ x 21″ or 30″
Longitudinal Travel (screw or lever)	10″ or 19″
Transverse Travel (screw or lever)	7″
Vertical Travel — Knee	13½″
Rise and Fall of Spindle	4½″
Selective Speed Ranges up to 5000 R.P.M.	
Weight	1250 lbs.

✓ RIGIDITY
Carefully designed, uniform-walled, box-type castings take full advantage of cast iron's strength.

✓ VERSATILITY
A "basic" machine easily tooled to handle tool room or production milling within its capacity. Mounting the work in the spindle permits Second Operation boring and facing.

✓ SPEED
For example, the Nichols Miller can turn out 1000 cuts an hour on one setup. Then, after a quick tool change, it can be ready for another job.



Send for your free copy of
"The Miller That Uses Its Head"

THE *Nichols* MILLER

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Meeting Steel Requirements the Hard Way—

But Still Meeting Them!

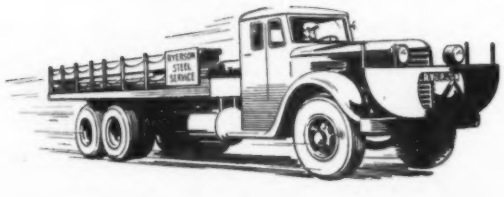
A manufacturer of coal mining drills was desperate for 2½" x 2½" x ¼" square tubing needed for drill supports, on an order scheduled for shipment halfway around the world. The required size of tubing was nowhere available, but Ryerson Steel Service was equal to the occasion.

By forming two channels from ¼" plate and welding the channels together we were able to deliver several hundred pieces of the required tubing! While such an emergency measure is obviously not always practical, it did make it possible for the customer to complete his order and ship on schedule. And this is but one of numerous instances where Ryerson service has achieved the seemingly unachievable.

There are many requirements that we cannot handle today, but it is often surprising what can be done with the close cooperation of your nearby Ryerson plant. If needed steel is out of stock the Ryerson salesman will sometimes be able to suggest a practical alternate steel, or he may know a way in which flame cutting, forming or welding can serve to provide a workable substitute.

So we urge you to keep in touch with us. Our whole organization is doing everything within its power to help every customer get the steel he needs.

JOSEPH T. RYERSON, Inc., Steel-Service Plants at: Chicago, Milwaukee, Detroit, St. Louis, Cincinnati, Cleveland, Pittsburgh, Philadelphia, Buffalo, New York, Boston, Los Angeles.



RYERSON STEEL

for upwards of twenty years, in fact as long as he was able to work.

Jim, one of the oldest employees in both age and years of continuous service, worked continuously for about forty years, was capable of doing only rough work, but was a very faithful and conscientious worker.

Joe, a young man with quite unusual ability for the few years that he had been in the business, gave the best of service for two years, but was lured by the wanderlust spirit finally, although he seemed to be perfectly contented.

Generally speaking the most capable mechanics have not secured their education in one place; they have usually made changes.

However, these changes have been made only when they could better themselves along educational and experience lines. I do not include in their number those who grow uneasy after a short time, whatever their surroundings may be. In other words, those most capable are not influenced by a mere whim, but have a valid reason for what they do whether it affects changing places or the quality of their work.

John Mark May,
Watervliet, N. Y.

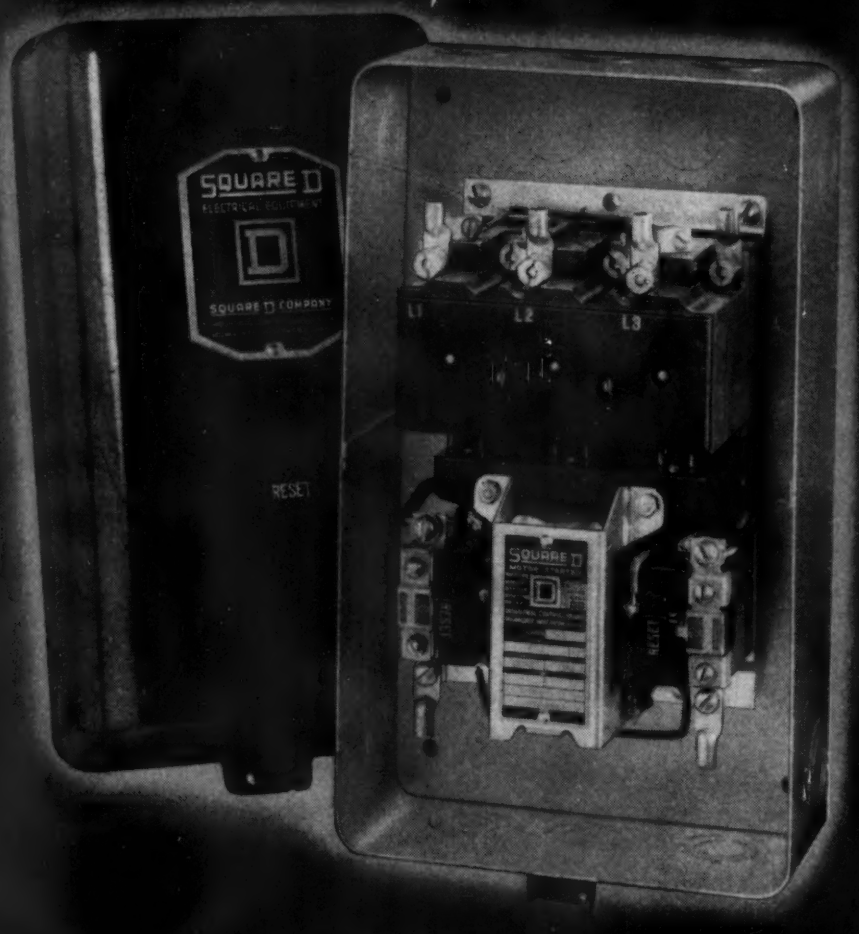
NEW BOOKS

MANUAL OF EMPLOYMENT INTERVIEWING—*Published by the American Management Association, 330 West 42nd St., New York 18, N. Y., as research report number 9. 75 pages. Price $1.50 to members, $2.25 to non-members.*

Purpose of the manual was to bring together the diverse data that exist with respect to effecive adminisration of the interview for employment purposes and, more specifically, for rank-and-file jobs rather than for specialized positions on higher levels.

Interviewing is increasingly recognized as a decisive force in plant administration and in public relations. Not only is it useful in initial selection and placement, but also in transfers, promotions and other applications of maintaining effective working body. This is emphasized in the manual, as well as the human aspects of interviewing, as shown by the statement, "If the company is entitled to information on which to base a forecast of the applicant's performance on the job, it is just as logical that the applicant be given

Performance Plus



Class 8536 A. C. Magnetic Starter — one of a complete line of Square D starters available in a wide range of sizes and enclosures.

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They are simply designed. Magnet coils, contacts and overload relays can be changed quickly, without disturbing external connections. They are compact, yet afford generous wiring space and easy-to-reach terminals. Installation and inspection are faster and easier. And—completeness of line (both A. C. and D. C.) means the right starter for any given application.

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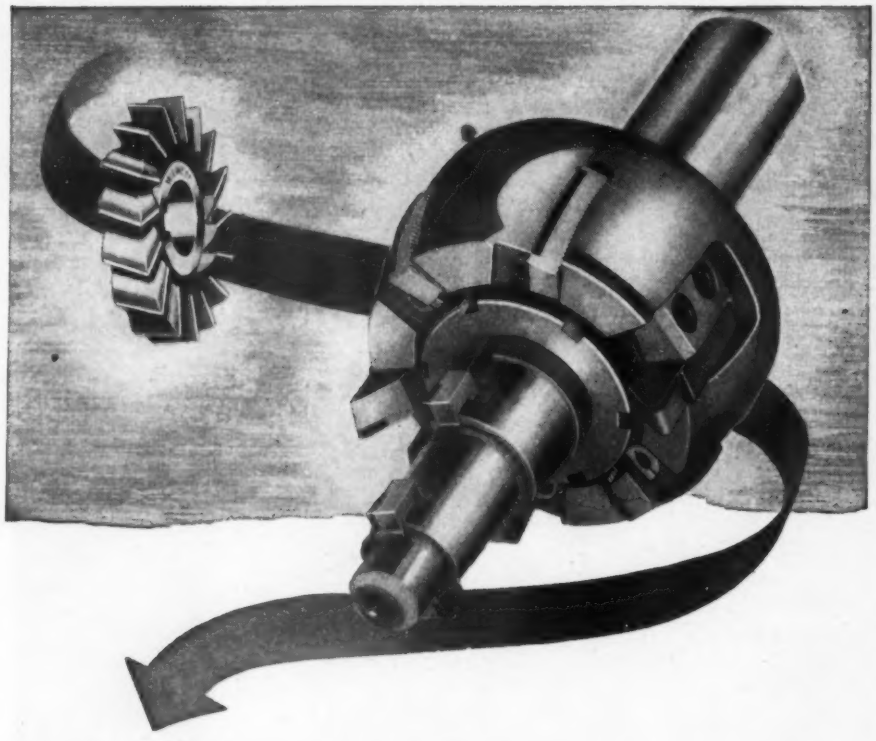


Now-here is what we're trying to put across--something that may be helpful to you...

The two samples shown above are metal cutting tools—one a simple standard milling cutter, the other a very special cutter that does six operations at one time. Midwest designed them, engineered them, produced them. They're shown to give you a quick idea of the extensive range of Midwest tools. They lead us to the message we want to put across.

To begin with, and as you suspected, the message comes from the Midwest Tool & Mfg. Co., location W. Jefferson at Travis, Detroit 16, Mich., when you want to write and find out just what help we can be when it comes to metal cutting tools.

We want you to write us about tooling problems you may have, little or big. They always involve production rates, costs, operations and all the other tooling factors, particularly on special set-ups, which make the difference between profit and loss in manufacturing. We've been in this metal cutting tool business over 35 years. The 35 years provide quite a bit of experience to draw upon. They give us something to offer you—something to help solve your metal cutting problems. Why not consult us now?

By the way — ask for this general metal cutting tool Bulletin 1041—one of several interesting bulletins published by Midwest.

enough facts to help him decide whether *he wants the job.*"

This excellent treatment covers in detail many suggestions on avoiding pitfalls in conducting interviews, among them being personal bias, pseudo-science, stereotyped interviews and the illusion of previous experience. Other points covered are importance of physical settings, interviewing techniques, standardized interviews, selection aids—job specifications, records, rating scales, etc., employment testing, investigation procedures and selected readings for interviewers. While the manual was not intended as a complete treatise on the subject, it will serve excellently as a guide to supervisors and line executives, as well as personnel-department interviewers.

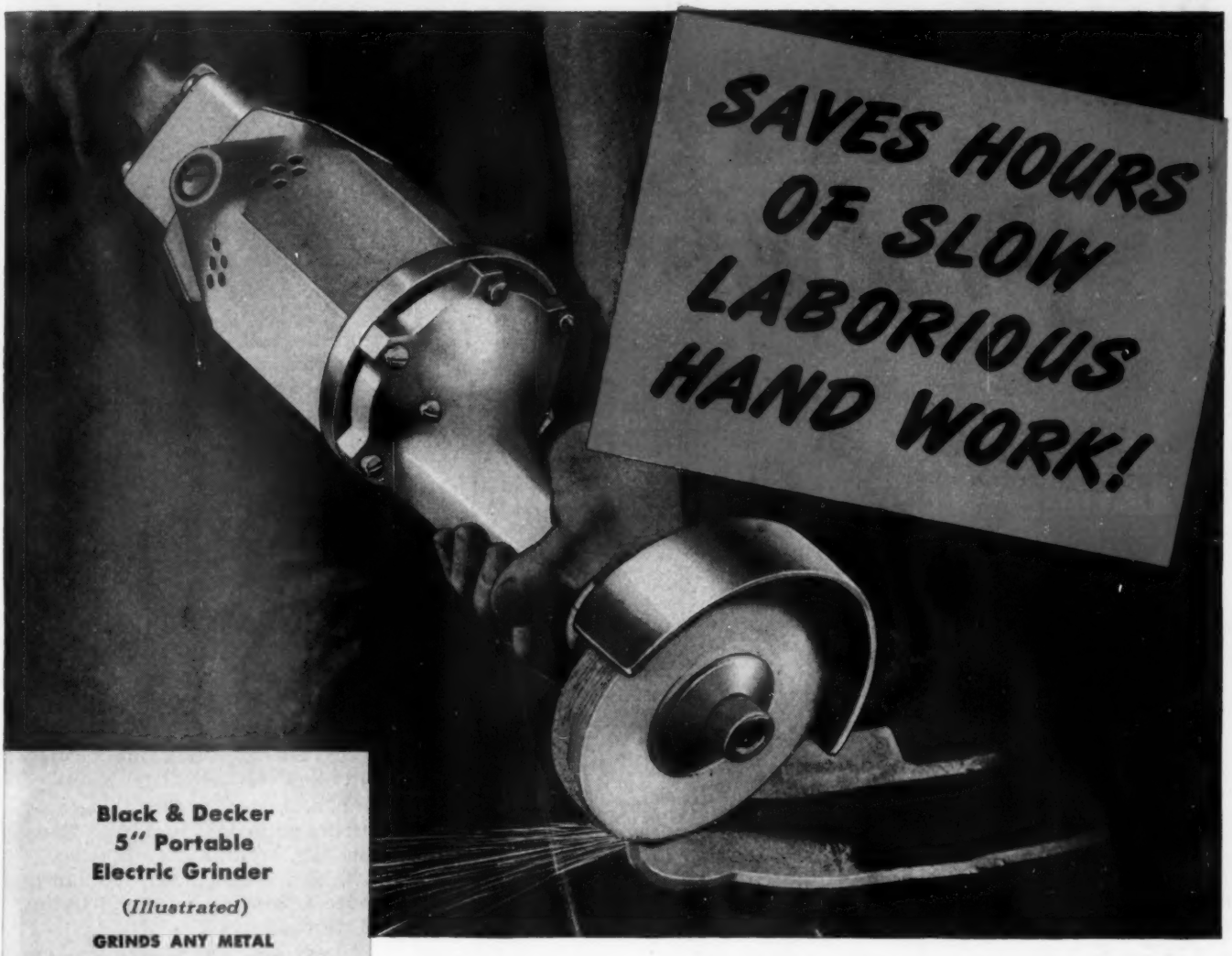
•

HOW TO HANDLE PROBLEMS ON SENIORITY—*By Dr. John A. Lapp. Published by the National Foremen's Institute, Inc., Deep River, Conn. 295 pages, 5⅜ x 7 in. Price $4.*

Seniority, only a few years ago, was simply certain rights secured by length of service with a company. The rules were simple and readily understood by both industry and labor.

But, in the past few years, labor has insisted on incorporation of seniority provisions in collective agreements, and most existing agreements provide for it. Both industry and labor are "seniority-conscious"—but frequently find they are not talking about the same thing, even within the same plant. Seniority in lay-offs, in rehiring and in promotions (the three principal applications) varies all over the lot. As a result, Dr. Lapp's book is badly needed. It is the third in a group on principles and practices in labor relations and is based on both the author's interest in the subject and on his participation in more than 50 arbitrations in which the application or interpretation of seniority provisions of labor contracts were involved. It is the belief that seniority provisions will become increasingly common and that, once installed, they will rarely be abandoned.

He covers the subject from definitions to typical agreement paragraphs, including application, acquisition, loss, promotion, lay-off, sharing work, rehiring, transfer, leave of absence, mechanics of handling, grievance procedure, disputes, legal aspects, provisions for veterans, and the like. Explanations are straightforward, in layman's terminology, hence understandable by anyone.



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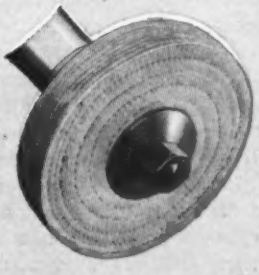
Electric Grinder
(Illustrated)
GRINDS ANY METAL

WIRE BRUSHES
AND BURNISHES



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Black & Decker Portable Electric Grinders are real time-savers on a wide variety of industrial jobs—where the tool must be carried to the work—in production, maintenance, repair and construction.

With their various attachments, they prepare surfaces for welding . . . smooth welds . . . snag and grind castings . . . cut off old rivets, bolts, studs . . . remove rust, scale, oxidation, old paint . . . clean tanks and structural metal . . . do spark testing . . . grind, clean and buff frames, cabinets and other assemblies.

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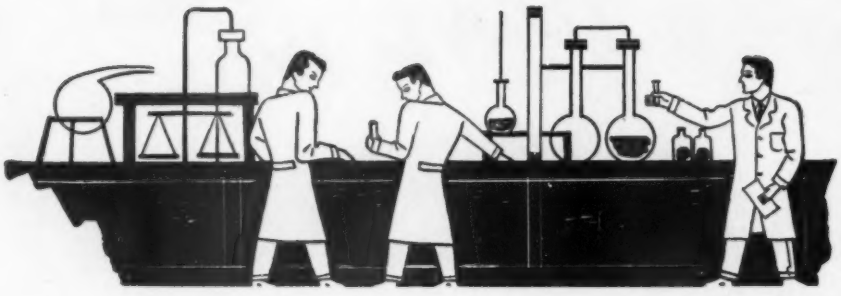

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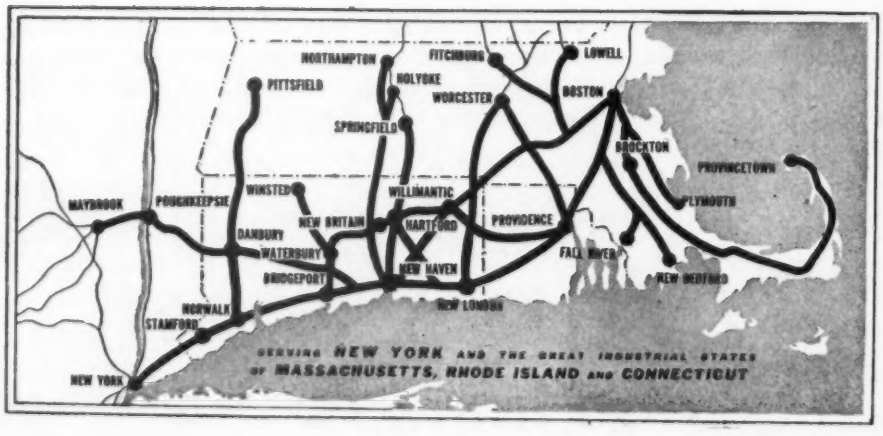
THE NEW HAVEN R. R.



DESIGN OF MOLDED ARTICLES—*Prepared and published by the Society of the Plastics Industry, 295 Madison Ave., New York, N. Y. Price, 1 to 4 copies, $1; 5 to 9 copies, $.85; 10 to 14 copies, $.80; over 15 copies, $.75.*

This sixth handbook prepared by S.P.I. offers a complete presentation of design problems and their solution in the average plant. The study was prepared by a committee of 12 authorities in plastics, headed by C. A. Norris and D. M. Buchanan of Bakelite Corporation.

It opens with a resumé of the six basic principles of proper design. First, selection of type of molding material after analysis by designer-draftsman, tool-builder, molder, material supplier and artist-designer is considered. Then design fundamentals are listed and basic drawings made, the designer adds color and style-form, mechanical drawings are prepared and a scale model constructed for demonstration. A single-cavity mold is then set up to enable planners to study mold shrinkage, dimensional accuracy, interchangeability and serviceability.

The book is divided into sections covering shrinkage, radii and fillets, undercuts, wall thickness, taper or draft, ribs, bosses, holes, flash lines, surface treatment, molded lettering and threads.

•

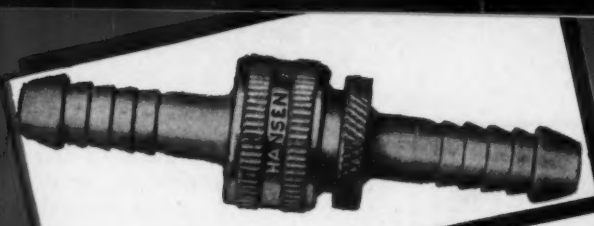
BEST'S SAFETY DIRECTORY—*Prepared and published by Alfred M. Best Company, Inc., 75 Fulton St., New York 7, N. Y. 351 pages. Price $5.*

Comprehensive and authentic information on the many hundreds of recognized safety and protective products and devices is presented with supporting illustrations. Based on expert advice from safety leaders and engineers in widely diversified lines of industry, the book provides a ready answer to the questions involving industrial safety: "What to use; when to use it; and where to get it?"

Management, safety directors, purchasing agents, plant superintendents and industrial medical personnel will find the book useful. Essential data on more than 1,000 products, devices and equipment in safety, first aid, hygiene, health conservation and fire protection are offered.

Designed to help prevent accidents, decrease production costs and eliminate time and energy normally wasted when writing, telephoning, or hunting around for safety information, the directory lists all safety products and all the latest improve-

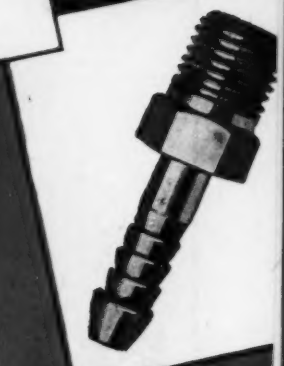
HANSEN



UNION STEMS

HOSE CLAMPS

OXYGEN COUPLING



HOSE STEM

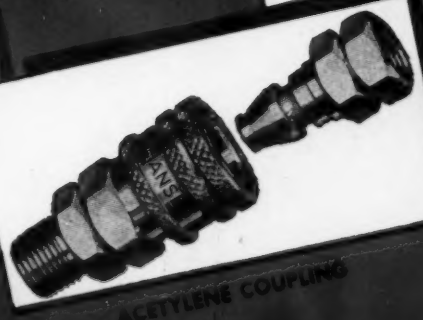
Industrial
AIRLINE EQUIPMENT

For over a quarter of a century Hansen airline equipment has not only pioneered and paced the field but has acquired an international reputation as the finest "precision made" equipment of its kind.

Our engineers, highly specialized, have had years of experience in creating, designing and introducing to industry new and improved equipment which has met with tremendous success, as is evidenced by the users of Hansen equipment. From the largest industrial plants in the world down to the small ones, you will find Hansen equipment widely used Hansen equipment has proven its worth, particularly in plants where peak production, economy, time and labor savings are essential.

GASOLINE COUPLING

PUSH-TITE COUPLING



ACETYLENE COUPLING

BLOW GUN

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HANSEN MFG. CO.

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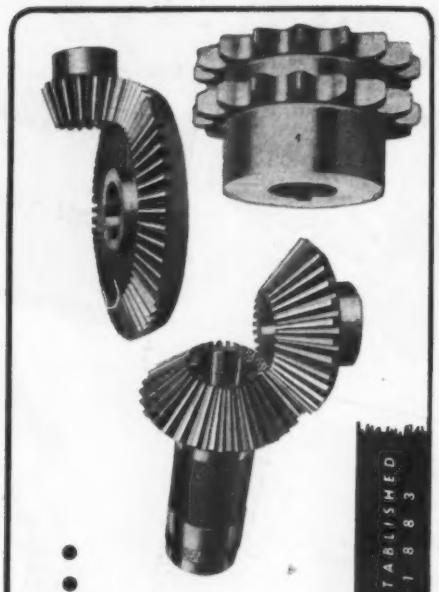
CLEVELAND 14, OHIO



GEARS...

We are specialists in the production of all types of gears in commercial sizes, to customers specifications. Full and immediate cooperation given by our engineers for your requirements.

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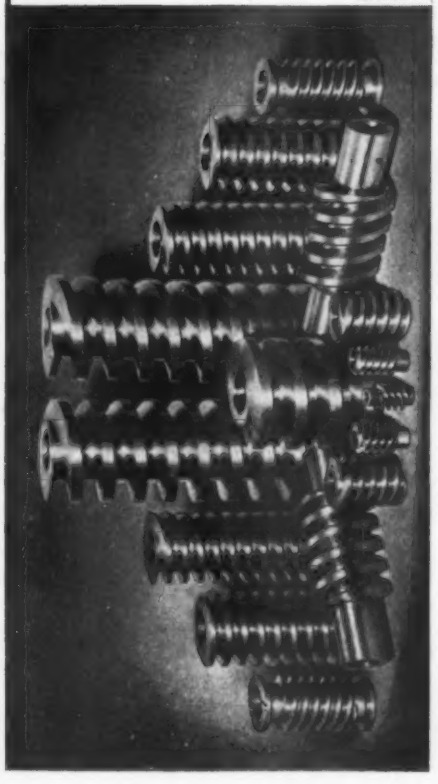
DUBUQUE, IOWA
ESTABLISHED 1883



ments, describes the hazard and remedy, points up the need and field of use of each product, and gives the names and addresses of manufacturers, distributors and local dealers.

The book reflects the time and effort spent in its preparation. It is one of the most complete treatments of industrial safety published and is part of the crusade to prevent accidental death, injury, fire and their staggering burden upon industry.

•

MATHEMATICAL AIDS FOR ENGINEERS —*By Raymond W. Dull, consulting engineer. Published by the McGraw-Hill Book Co., 330 West 42nd Street, New York 18, N. Y. 346 pages, 5¼ x 8¼ in. Price $4.50.*

Recognizing that present-day engineering frequently requires higher mathematics, Mr. Dull has gathered together many basic mathematical tools, old and new. Fundamentals are here applied to many typical problems.

Among subjects are uniform scales, logarithms, organic growth and decay functions, right-angled triangles, circles, vectors, forces and couples, polygons, imaginary and complex numbers, hyperbolic functions, harmonic and linear motions, energy, rotation, momentum and differential equations.

This is not a beginner's text, but an application manual. It does however offer both a review and a reference for efficient use of mathematics in engineering.

•

THE ALUMINUM INDUSTRY—*By Stanley V. Malcuit. Published by the Bellman Publishing Co., Inc., 83 Newbury St., Boston 8, Mass. 36 pages. Price $1.*

This monograph is intended to acquaint ambitious young men and women with the organization and operations of the aluminum industry, and the opportunities it offers them. This booklet affords a clear and concise description of the aluminum industry, discussing the mining of the ore, the production of alumina, the reduction of aluminum, semi-fabrication and manufacturing operations and the marketing of aluminum products.

Of particular interest is an analytical index of occupations in the industry. Typical jobs are described along with personal qualifications.

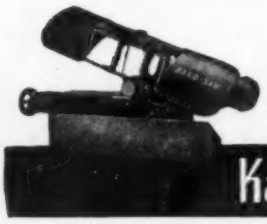
Interchangable Motor Mount
- a feature of the KALAMAZOO

NO DELAYS

You can't afford to risk production losses on cut-off work by motor failure. The Kalamazoo use no special motor housings or end bells, but has a motor mounting that permits the use of any standard type motor.

Kalamazoo engineers designed this feature into this machine so there would be no headaches due to temporary motor repairs. You merely substitute any motor available and production speeds merrily along.

Ask your dealer or write direct for complete information.



MACHINE TOOL DIVISION
Kalamazoo Tank & Silo Co., Kalamazoo 16, Michigan
IN CANADA—BRIDGE MACHINERY CO., MONTREAL

Kalamazoo Metal Cutting Band Saw

Fixed Nuts Stay Put-BUT

Even if your bolted assembly needs a fixed nut—remember that vibration and wear will loosen all other parts unless you use a strong spring washer to expand and hold all parts tight as wear occurs.

True, a good fixed nut will not move up or down on a bolt;—but the other parts of bolted assemblies inevitably loosen because of bolt stretch, the frictional wear of metal on metal, burrs, flares, and the pulverizing of paint, scale and rust.

A live spring washer—a long-range spring washer—is absolutely essential if you expect your whole assembly to be held tight as wear occurs. The expanding spring action keeps up the pressure on all parts as friction loosens them.

No matter what kind of nut you use—fixed or standard—be sure to specify a Kantlink spring washer. There is no substitute.

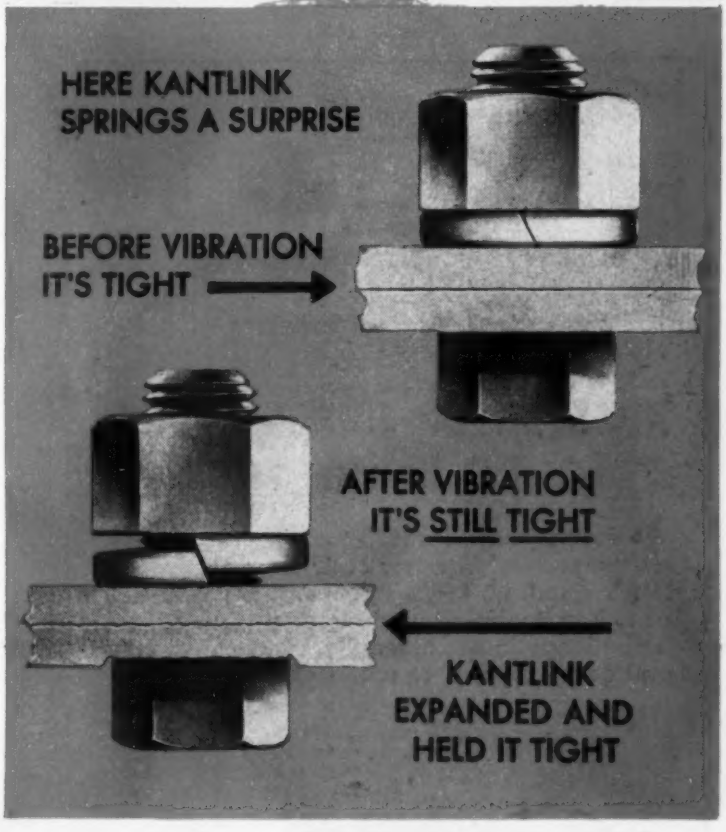
Originators of Kantlink the long-range spring washer.

Originators of

KANTLINK TRADE MARK

the long-range spring washer

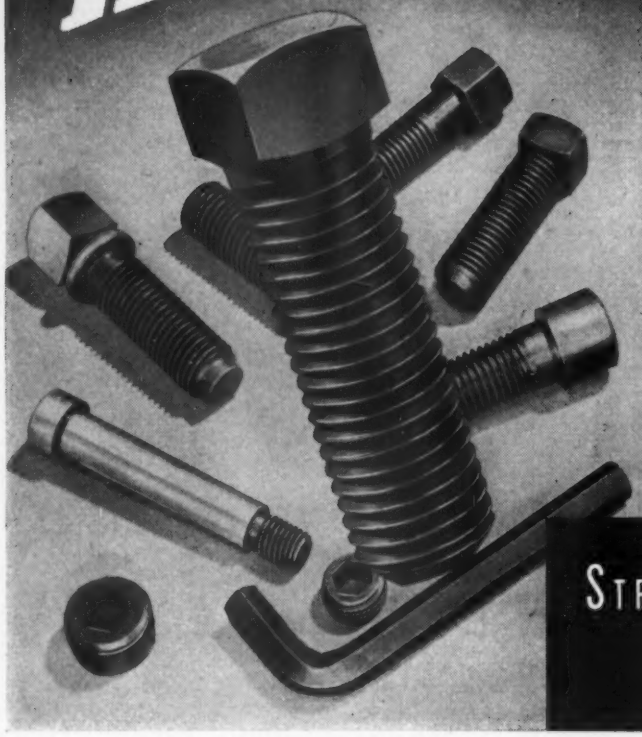
Let's Spike the Nut to prove our Point
Here no Spring Washer is Used
BEFORE VIBRATION IT'S TIGHT
AFTER VIBRATION IT'S LOOSE
The Nut never moved—but the parts wore loose


HERE KANTLINK SPRINGS A SURPRISE
BEFORE VIBRATION IT'S TIGHT
AFTER VIBRATION IT'S STILL TIGHT
KANTLINK EXPANDED AND HELD IT TIGHT

THE NATIONAL LOCK WASHER COMPANY

Newark 5, New Jersey — Milwaukee 2, Wisconsin

Mac-it ALLOY STEEL SCREWS



Get EXTRA strength on EXTRA TOUGH JOBS with SQUARE HEAD SET SCREWS!

Mac-it Quality Square Head Set Screws have extra resistance and strength on jobs where they must take terrific punishment. No upsetting or mushrooming of points, no breaking off under the head. *All* Mac-it screws are heat-treated and accurately made with die-cut threads. Whatever your needs, let the *complete* Mac-it line serve you. Sold through recognized distributors from coast to coast and in Canada.

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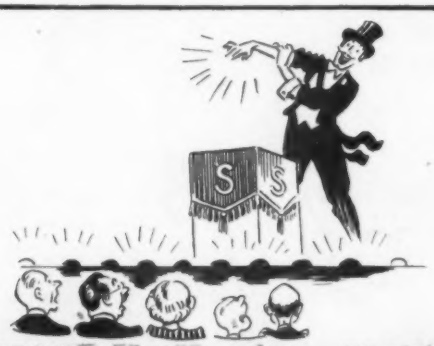

NOTHING UP OUR SLEEVES- It's All in the TOOL!

We design particular tools to do particular jobs, easily, precisely, at low cost. No tooling order is too small, no tooling difficulty is too big for us to handle. Your tool designing problems are a challenge to our ingenuity, mechanical skill, and over 40 years of sound experience.

JIGS • FIXTURES • SPECIAL TOOLS
BUILDING COMPLETE MACHINE TOOLS
UNITS FOR MACHINE TOOLS
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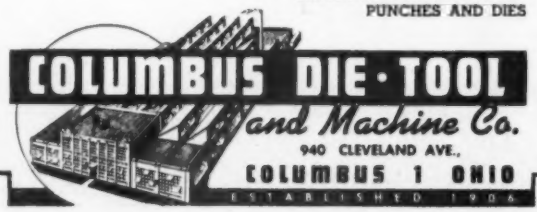

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1846 — One hundred years of continuous service to industry — 1946

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ALLOY STEELS

A century of experience in the development and application of special steels for PRODUCTION, TOOL ROOM, MAINTENANCE.

Seven warehouse stocks of rounds, flats, squares, hexagons, octagons. Forgings to specification.

Write for our data sheet book.

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Steel-Weld FABRICATION

The plant equipment of The R. C. Mahon Company includes every modern device known today to facilitate welded steel fabrication . . . this, coupled with plant capacity for heavy fabrication of any shape, size or weight provides you with an excellent source for your requirements large or small. A staff of design engineers and highly skilled craftsmen, in the Steel-Weld Division, are maintained to assure you every advantage of Steel-Weld Fabrication.

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THE R. C. MAHON COMPANY
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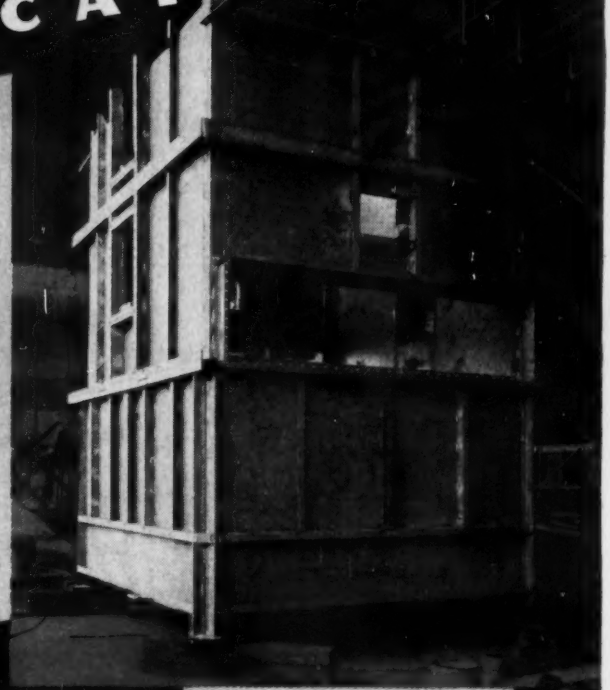
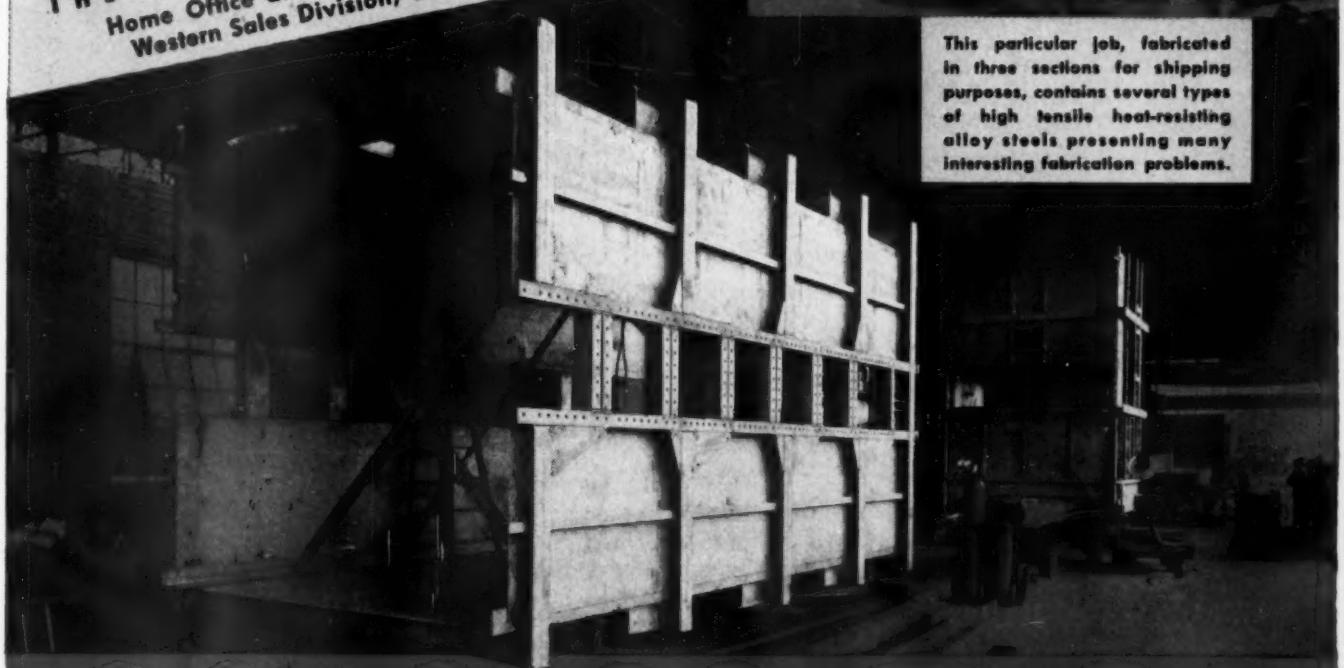




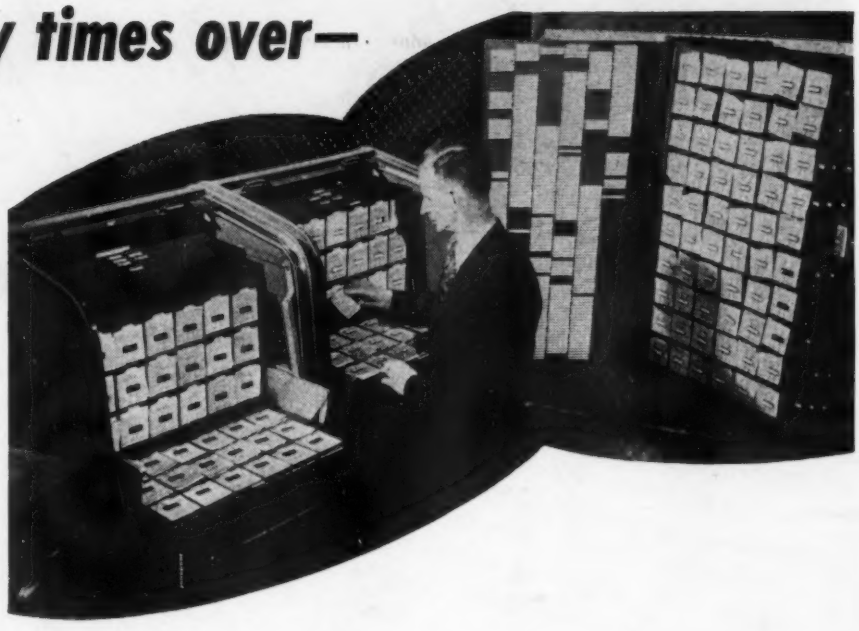
This particular job, fabricated in three sections for shipping purposes, contains several types of high tensile heat-resisting alloy steels presenting many interesting fabrication problems.

MAHON

Engineers and Fabricators of Welded Steel Machine Bases and Frames, and Many Other Welded Steel Products

FLEXIBLE TOOL CONTROL

repays costs many times over—



How General Electric Company, East Plant Motor Division, Pittsfield, Mass., reduced tool requirements and loss, with numerous other savings over a three year period thru use of McCaskey Tool Control is told by Charles W. Reagan Tools and Methods Dept., in the August 1946 issue of Factory Management and Maintenance.

Cost-cutting results similar to these, abstracted from his statements, can be duplicated in your plant, large or small:

- Complete over-all control of tools thru a compact, flexible system, readily adaptable to varied manufacturing needs;
- Tool requirements by departments determined and cut to minimum—more production with less tools;
- Inventory loss held to fraction of 1 percent —losses almost negligible;
- Hoarding of tools discouraged;
- *Serviceability of various types of tools compared*—loss and breakage checked;
- Swift and accurate inventory of all tools by depts.; tool costs readily available;
- Delivery expectation and re-order points established, insuring timely deliveries;
- System immediately operated by untrained and inexperienced employees;
- Clearance time for transferring or terminating employees cut to minimum—invaluable in placing responsibility for tools;
- Has paid for cost of equipment many times over—vital factor in success of tool division.

Whether you have one or a dozen cribs, production or maintenance tools, McCaskey Control will cut your tool costs and give you faster tool service. Reprints of Mr. Reagan's article, ***"Flexible Tool Control Repays Costs Many Times Over,"*** *are available on request. Write today for a copy, together with similar reports of cost-reduction and improved operations in other well known plants.*

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Ontario, Canada — *The McCaskey Register Co., Watford, England*

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

It's the SIDES of a V-Belt That Really Get the WEAR!

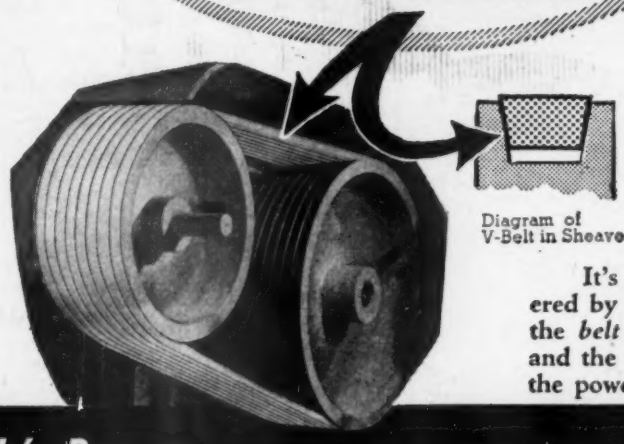
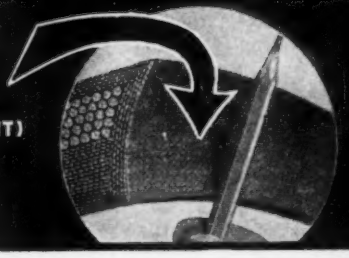


Diagram of V-Belt in Sheave

Look at this diagram of a V-Belt in its sheave. You see at once that the *sides* of the belt do all the gripping on the pulley and get all the wear against the sheave-groove wall.

It's the *sides,* moreover, that pick up all the power delivered by the driver pulley. The sides *transmit* that power to the *belt as a whole.* And then, once more, it's the sides—and the sides *alone*—that grip the driven pulley and *deliver* the power to it.

It's Because the CONCAVE SIDE (A GATES PATENT) Reduces Sidewall Wear That It Is IMPORTANT to You!



The fact that the *side* is the part that does the work and gets the wear explains why you have always noticed that the sidewall of the *ordinary* V-Belt is the part that wears out *first.* Naturally, then, when you lengthen the life of the sidewall you lengthen the life of the belt.

The simple diagrams on the right show exactly why the ordinary, *straight-sided* V-Belt gets excessive wear along the *middle of the sides.* They show also why the Patented Concave Side *greatly reduces* sidewall wear in Gates Vulco Ropes. That is the simple reason why your Gates Vulco Ropes are giving you so much longer service than any straight-sided V-Belts can possibly give.

Longer Sidewall Wear Is *MORE IMPORTANT NOW* Than ever before!

Now that Gates Specialized Research has resulted in V-Belts having much stronger tension members—tension members of Rayon Cords and Flexible Steel Cables, among others—the sidewall of the belt is often called upon to transmit to the pulley much heavier loads. Naturally, with heavier loading on the sidewall the life-prolonging Concave Side is more important today than ever before!

Straight Sided V-Belt — FIG. 1

How Straight Sided V-Belts Bulges When Bending Around Its Pulley — FIG. 1-A

You can actually feel the bulging of a straight-sided V-Belt by holding the sides between your finger and thumb and then bending the belt. Naturally, this bulging produces excessive wear along the middle of the sidewall as indicated by arrows.

Gates V-Belt with Patented Concave Sidewall — FIG. 2

Showing How Concave Side of Gates V-Belt Straightens to Make Perfect Fit in Sheave Groove When Belt Is Bending Over Pulley — FIG. 2-A

No Bulging against the sides of the sheave groove means that sidewall wear is evenly distributed over the full width of the sidewall—and that means much longer life for the belt!

4612

THE GATES RUBBER COMPANY
Denver, U.S.A.
World's Largest Makers of V-Belts

Gates
REG. U. S. PAT. OFF.
THE MARK OF SPECIALIZED RESEARCH

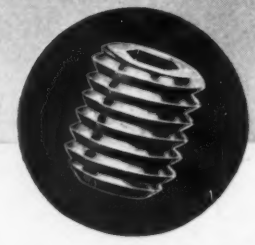
GATES VULCO ROPE DRIVES

Engineering Offices and Jobber Stocks **IN ALL INDUSTRIAL CENTERS** **of the U. S. and 71 Foreign Countries**

FLEXIBLE COUPLINGS

Made by GUARDIAN PRODUCTS CO., Michigan City, Ind.

assured of firm hold on shafts



ALLEN SET SCREWS

apply the Grip

Flexible Couplings made by GUARDIAN PRODUCTS COMPANY of Michigan City, Indiana are widely used to connect drive shafts of motors with those of moving parts in household mechanical equipment and appliances for smoother, more quiet operation with less vibration.

ALLEN Hollow Set Screws are used to make the connections *secure.* These hex-socket screws are handily set up with Allen Hex Keys, — so tightly that they never work loose or let a drive shaft slip. The screws are threaded to a high Class 3 fit for the maximum of frictional HOLDING-POWER in the tapped hole.

Ask your local Allen Distributor for samples to test for any application you have in mind. Also test samples of Allen Socket Head Cap Screws, Flat Head Cap Screws, Socket Head Shoulder Screws and "Tru-Ground" Dowel Pins.

THE ALLEN MANUFACTURING COMPANY
HARTFORD 1, . . . CONNECTICUT, U.S.A.

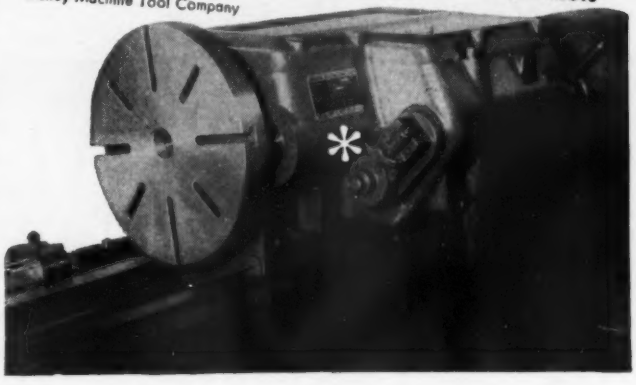
NO OTHER PUMPS FIT THE JOB * LIKE TUTHILL STRIPPED PUMPS

Tuthill Stripped Pumps are designed to meet the demand for pumps that can be built into machines to improve their appearance, save space and reduce cost to machinery manufacturers.

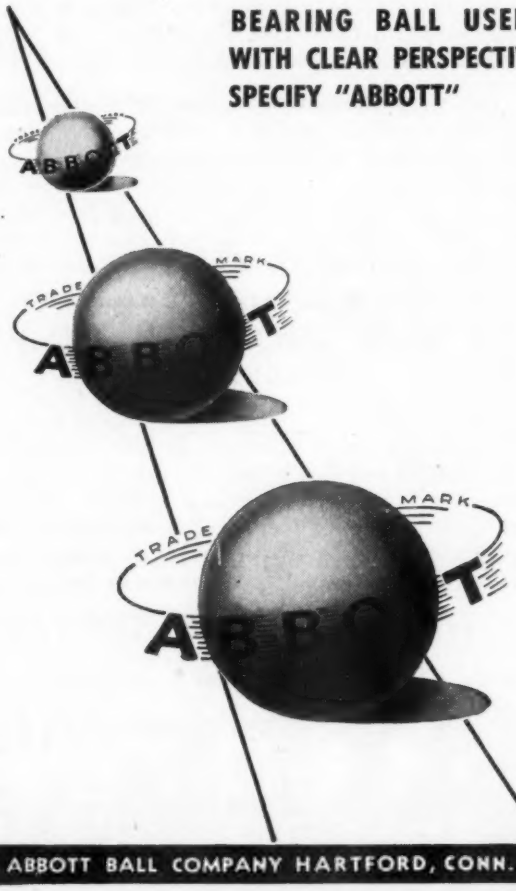
These pumps are furnished as Type S without the mounting bracket, and as Type SA with pumping elements only. Today, Tuthill is the only source for these Stripped Pumps in sizes and models to meet your requirements in lubrication, coolant, hydraulic and liquid transfer service. Capacities—1 to 50 g.p.m. Write for Stripped Pump Bulletin.

TUTHILL PUMP COMPANY
939 East 95th Street • Chicago 19, Illinois

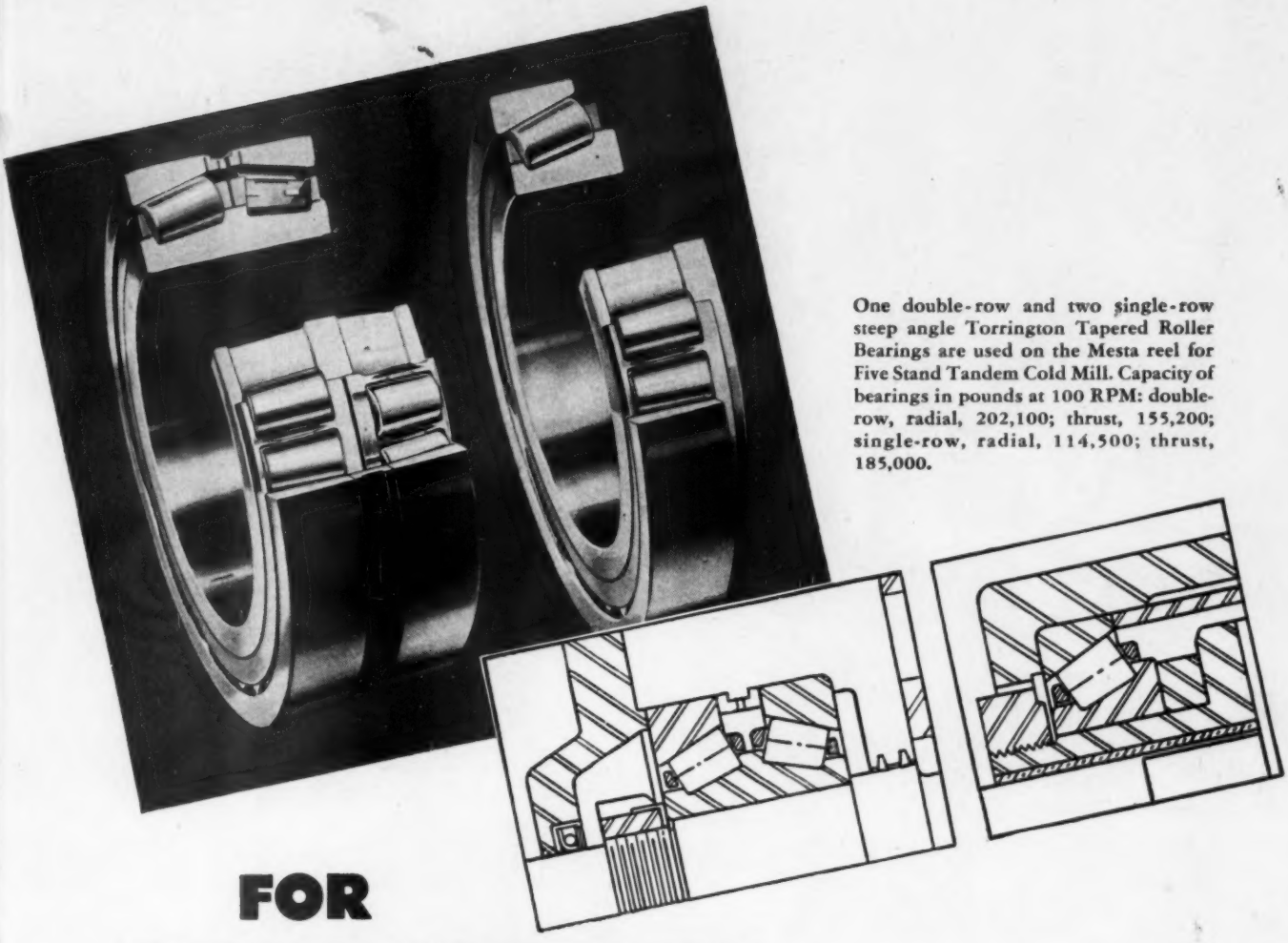
Photo courtesy Sidney Machine Tool Company



BEARING BALL USERS WITH CLEAR PERSPECTIVE SPECIFY "ABBOTT"



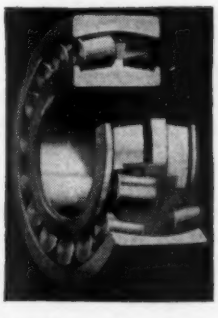
THE ABBOTT BALL COMPANY HARTFORD, CONN. U.S.A.



One double-row and two single-row steep angle Torrington Tapered Roller Bearings are used on the Mesta reel for Five Stand Tandem Cold Mill. Capacity of bearings in pounds at 100 RPM: double-row, radial, 202,100; thrust, 155,200; single-row, radial, 114,500; thrust, 185,000.

FOR FASTER COLD MILL REELS... AND OTHER HEAVY-DUTY EQUIPMENT

THE TORRINGTON SELF-ALIGNING SPHERICAL ROLLER BEARING



features self-alignment, two-directional thrust and unit construction for easy installation and handling. It will be manufactured in a complete range of sizes from 1.5748" bore and up. See your nearest Torrington Representative or write for Bulletin 200.

The reel of the cold mill mentioned above is one of the world's fastest. It "coils" 3,200 feet of strip per minute . . . and at required tension for final quality control. That means extreme radial and thrust loads on the reel . . . loads handled efficiently by one double-row and two single-row, steep angle Torrington Tapered Roller Bearings.

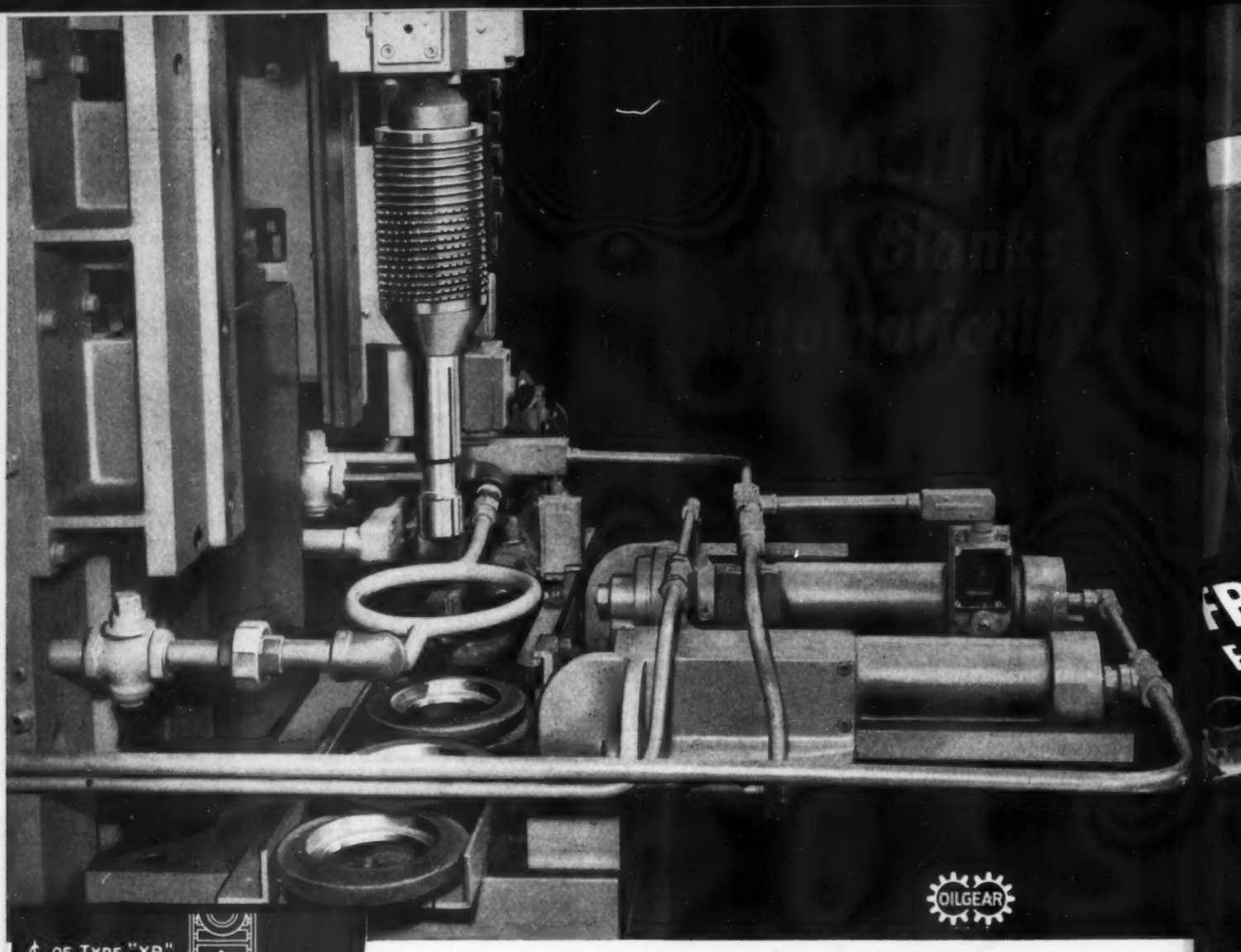
On steel and paper mill machinery . . . on oil field and hoisting equipment . . . on machine tools and other heavy-duty applications . . . bearings designed and built by Torrington's Bantam Bearings Division provide efficient, economical, trouble-free *anti-friction operation.*

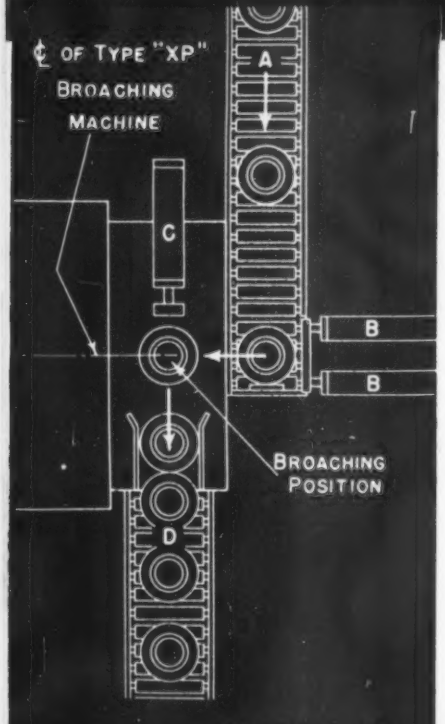
In today's competitive markets, you should assure yourself that kind of performance from *your* heavy-duty machinery. Our engineers will gladly help yours to incorporate Torrington Bearing advantages in your designs.

THE TORRINGTON COMPANY
BANTAM BEARINGS DIVISION • SOUTH BEND 21, IND.

TORRINGTON BEARINGS

SPHERICAL ROLLER • STRAIGHT ROLLER • TAPERED ROLLER • NEEDLE • BALL





Oilgear Vertical Pull-Down Broaching Machine continuously loa broaches and unloads hypoid bevel gear blanks . . . *automatica*

This Oilgear Type "XP" Vertical Pull-Down Broaching Machine with automa loading and unloading mechanism is operating at the Fort Wayne plant of the Spi Mfg. Co. Its job is to finish broach holes in the forged steel hypoid bevel dr gear blanks fed to it from a boring machine by means of a conveyor.

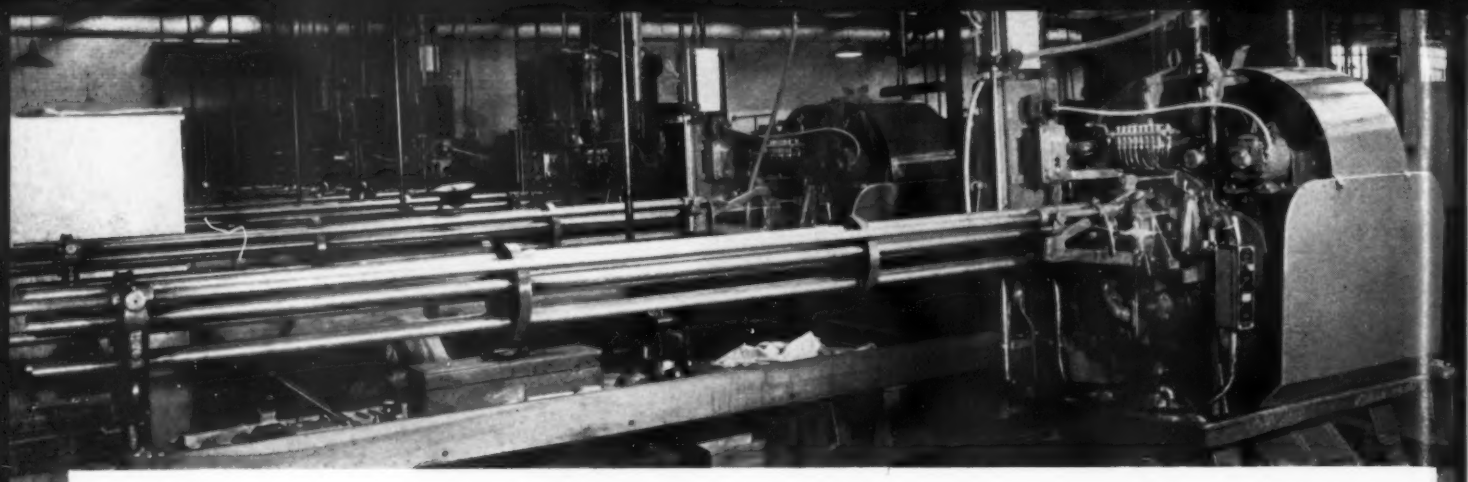
Two fluid power cylinders remove the blank from the conveyor and place it the broaching position on the machine. As tool descends, shank accurately loca blank. Tool is pulled downward to broach part. Another fluid power cylin pushes the finished part onto a second conveyor which takes it away. There's manual loading—no levers or buttons to operate—no manual threading of p over tool shank—no cautious centralizing of part by hand—no manual handli of tool—no manual unloading. All operations are automatic, continuous and attended.

The Oilgear Automatic Broaching Machine removes approximately .020" stock on the diameter and produces 225 finished ring gear blanks per hour. Ot sizes of bevel gear blanks can be broached on the same machine by changing broaching shells on the tool steel bar.

If you are looking for faster production and lower costs, investigate Oilg Broaching Machines, either vertical or horizontal for every type of internal a external broaching. They provide high broaching and return speeds, infini adjustable. They make more efficient use of electric power hence require sma motors. They make more efficient use of oil medium hence require much sma reservoirs. They provide manual, semi-automatic and full automatic control at extra cost. THE OILGEAR COMPANY, 1313 W. Bruce St., Milwaukee 4, W

Oilgear Fluid Power

REVERE
FREE CUTTING BRASS ROD
FOR QUICK, ECONOMICAL MACHINING
1—Special flange fitting
2—Flexible tube adapter
3—½" high-pressure fitting
4—Tapered hose connection
5—Flared-type fitting
6—Bushing for pressure tube fitting
7—Inverted S.A.E. swivel union
8—Automotive brake cylinder
9—Faucet handle
10—Flared-type fitting
11—Hot water cut-off valve
12—Oil tank cap part
13—½" I.P.S. male fitting
14—Valve stem regulator
15—Welding hose connection
16—Automotive air brake part
17—Water valve stem pack nut
18 & 19—Lamp top ornaments
20—Carbureter valve
21—Welding hose connection
22—Oil feeder valve
23—Valve stem
24—Pack nut
25—Inverted S.A.E. swivel union
26—Male swivel detachable union
27—Flared-type fitting
28—Detachable ring-type hose fitting
29—Compression fitting assembly
30—Oil feeder adjusting valve
31—7/16" female compression union
32—Fuse part
33—S.A.E. long nut
34—Orifice spud
35—Worm gear
36—Threaded sleeve-type union
37—Toilet tank spud
38—Acorn nuts for finish trim
39—Hex nuts



Facts about REVERE FREE CUTTING BRASS ROD

Lead Content. Revere Free Cutting Brass Rod contains about 3% lead. This is not dissolved but is thoroughly distributed throughout the metal in the form of finely-divided particles. The lead reduces friction by causing the chips to break off short, so that they are in only momentary contact with the cutting edge of the tool. This lessens the amount of heat generated. Life of the tool is correspondingly extended, and long runs without regrinding are usual.

Machining Speeds. Surface speeds as high as 700 feet per minute are possible. Rough cuts as deep as 0.020" can be taken. Such speeds and cuts materially reduce production time over other materials having less outstanding machining characteristics.

Finish. With proper tooling, parts made of Revere Free Cutting Brass Rod come from the machine with a brilliant, smooth, highly-polished appearance, due to the practically flawless surface. Any tolerance within the capability of the machine and operator may be easily obtained. Threads are sharp and clean down to their roots.

No Burrs. This metal may be cut- and roll-threaded, drilled and tapped, milled, broached, and sawed with no appreciable burrs.

Temper. In the majority of cases, Revere Free Cutting Brass Rod is supplied hard drawn. This hardness facilitates chip breakage, while the high strength resulting from drawing assures strong threads. However, if desired for special purposes, Revere can supply soft Free Cutting Brass Rod.

High Standards. Revere Free Cutting Brass Rod is drawn to close tolerances on dimensions and straightness, and is stress-relieved after drawing. The metallurgical and physical characteristics of the metal are under constant laboratory check. It is therefore especially suitable for automatic screw machines, which require stock having high uniformity in quality and dimensions.

Additional Advantages. The smooth surfaces produced by machining Revere Free Cutting Brass Rod are ideal for plating. The metal is easily soldered, can be welded if desired, and it is of course non-rusting and corrosion-resistant. Even at a slightly higher cost over other materials, this brass often is more economical for screw machine production, due to the speed with which the various operations may be conducted, and the value of the scrap.

Consult Revere. Because no single metal or alloy is suitable for all requirements, Revere offers many, each having some outstanding virtues and advantages. Selection of the most advantageous Revere Metal for a given process, part, or product may make a big improvement in such important items as cost of manufacture, durability, and even saleability. The Revere Technical Advisory Service will gladly cooperate with you in studying your requirements.

TYPICAL PROPERTIES

REVERE
FREE CUTTING BRASS ROD
Alloy No. 240

COMPOSITION
Copper 61.5%
Zinc 35.5
Lead 3.0

TENSILE STRENGTH
Hard* 65,000 pounds per square inch
Soft† 50,000

ELONGATION
% in 2 inches
Hard* 15
Soft† 50

DENSITY
0.307 lbs. per cubic inch

COEFFICIENT OF EXPANSION
.0000113 per °F @ 68° F

ELECTRICAL CONDUCTIVITY
28.6 (% I.A.C.S. @ 68° F)

THERMAL CONDUCTIVITY
73 Btu. per sq. ft. per ft. per hr. per °F @ 68° F

*Hard, Rockwell B72 (app.)
†Soft, Rockwell F65 (app.)

Revere Metals include: *Copper and Copper Alloys:* Sheet and Plate, Roll and Strip, Rod and Bar, Tube and Pipe, Extruded Shapes, Forgings; *Aluminum Alloys:* Tube, Extruded Shapes, Forgings; *Magnesium Alloys:* Sheet and Plate, Rod and Bar, Tube, Extruded Shapes, Forgings; *Steel:* Electric Welded Steel Tube.

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Founded by Paul Revere in 1801

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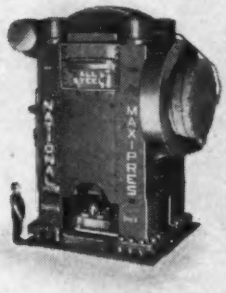

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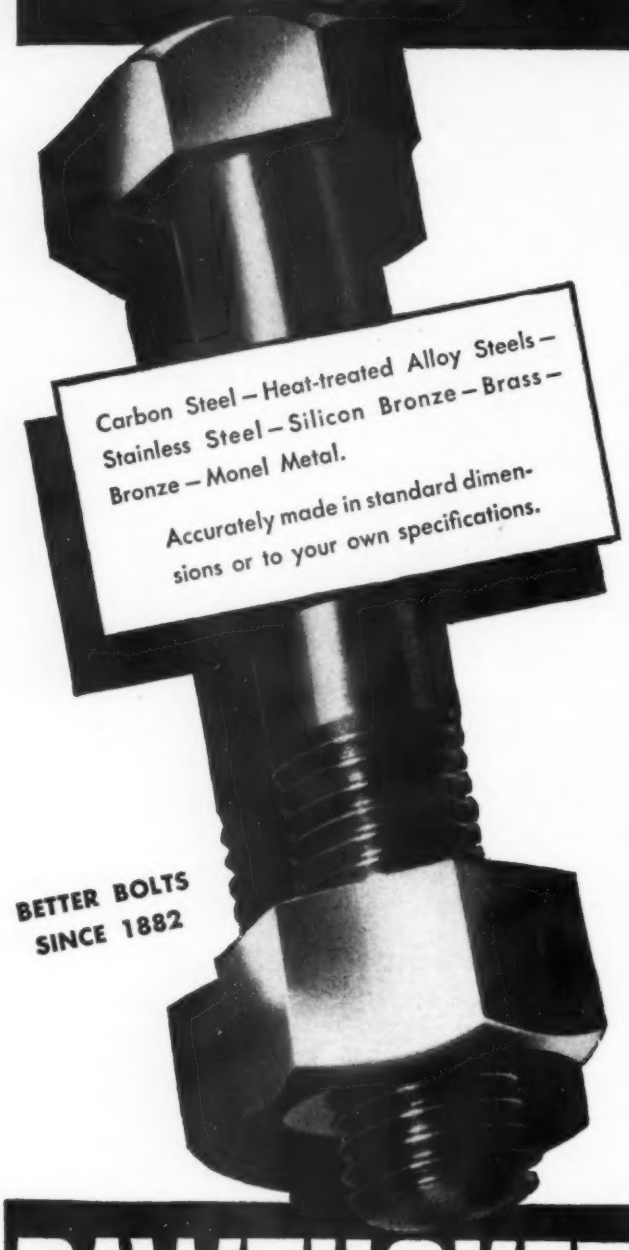

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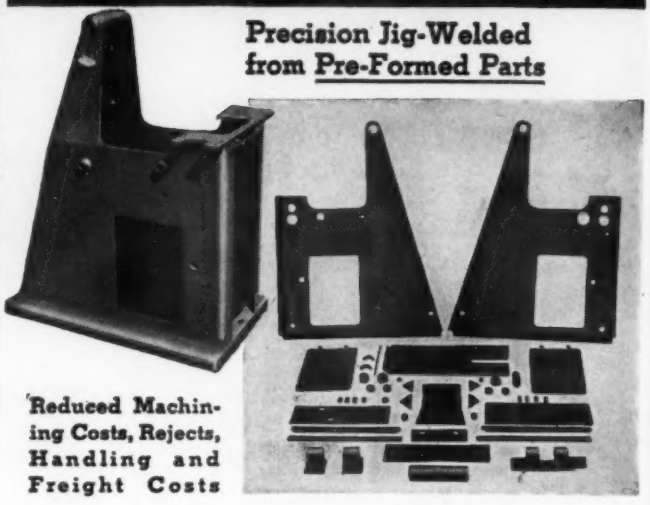

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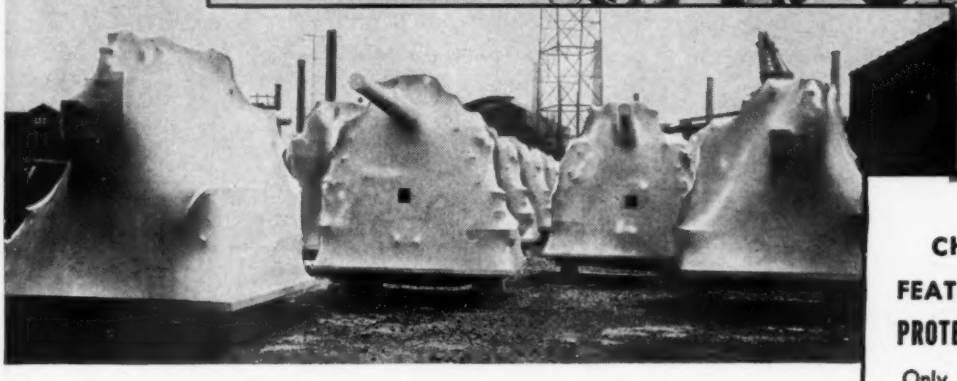

OUTDOOR STORAGE TODAY WITH *COCOON*

That is not a junk yard in the top photograph! What you see exposed to the weather are valuable drills, presses, stamps, dies stored in the open for lack of indoor facilities. Today, such equipment can be stored outside *safely*, fully protected against snow, rain, sun by COCOON, the amazing new protective packaging applied with a spray gun. COCOON *affords perfect protection, during shipment or storage anywhere in the world, for anything from a ball bearing to a locomotive!*

Whether *your* protective packaging problems involve electric fans, appliances, machine tools, precision instruments, small parts, or huge machines, it would be to your advantage to find out what COCOON can do for you. Submit your problem to us for analysis. *R. M. Hollingshead Corporation, Coatings Division, Camden, New Jersey; Toronto, Canada.*

CHECK THESE *COCOON* FEATURES AGAINST *YOUR* PROTECTIVE PACKAGING NEEDS:

Only standard paint spray equipment is needed . . . No rust preventive treatments are necessary . . . Permits packaging of equipment "ready to use" . . . Resists attack by major mildew and mold groups . . . Tensile strength 2000 p.s.i.; elongation 200% . . . Won't soften at plus 180°F.; remains flexible at minus 40°F. . . . Has extremely low moisture-vapor transmission rate . . . Makes packaging easy regardless of size and shape complications . . . Eliminates need for any pre-designed form or fabrications . . . Easily stripped from equipment in long, continuous sheets.

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LEADER IN MAINTENANCE CHEMICALS

Whiz

Applied with a spray gun Strips off like a banana peel

Millions of dollars worth of materials and machinery TECTYL - protected against rust by

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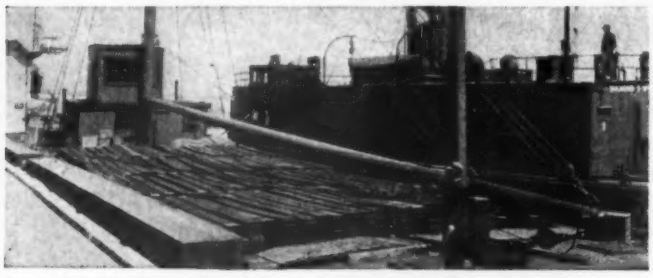
Unloading steel, badly rusted in sea disaster—from an unretouched photograph



Unretouched photograph of same steel, reloaded, after being processed with Tectyl

One Application of Tectyl Protects against Rust and Corrosion up to 2 Years

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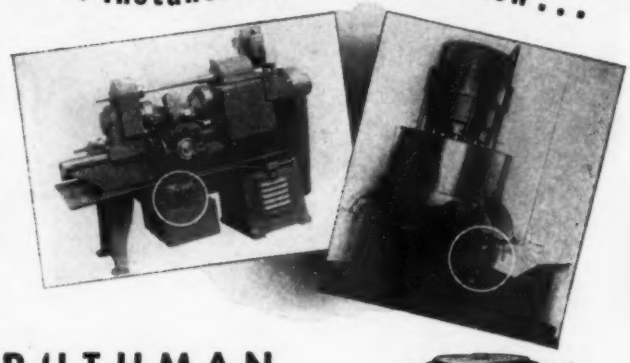

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Machine tool manufacturers realize the importance of "split second" coolant control, from a trickle to full volume. That's why so many of them install Ruthman Gusher Coolant Pumps as standard equipment.

Left above is a 1/10 H.P. MODEL 1-P3 GUSHER COOLANT PUMP installed on a LEBLOND #1 CRANKSHAFT LATHE. To the right is a ½ H.P. MODEL H. L. 7420 RUTHMAN GUSHER PUMP installed on a "BAIRD 5" FOUR SPINDLE VERTICAL CONTINUOUS LATHE.

Write for Catalog 10A

Photos courtesy, The Baird Machine Co. The R. K. LeBlond Machine Tool

THE RUTHMAN MACHINERY CO.

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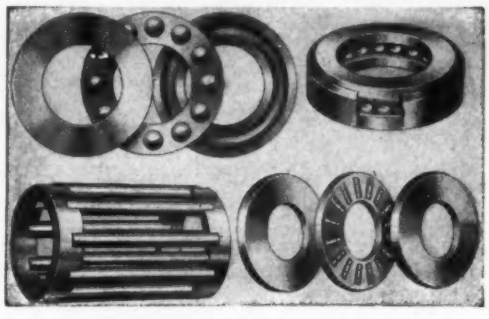

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ROCKFORD MACHINE TOOL CO.
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DUPLICATING UNIT
installed on Double-Housing Planer

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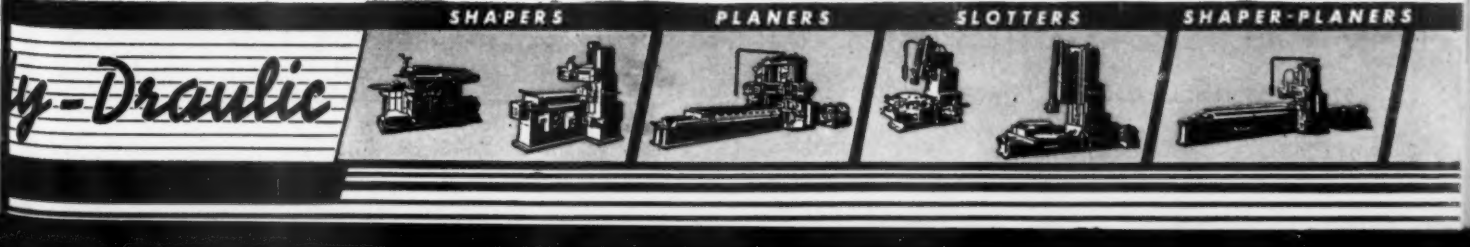
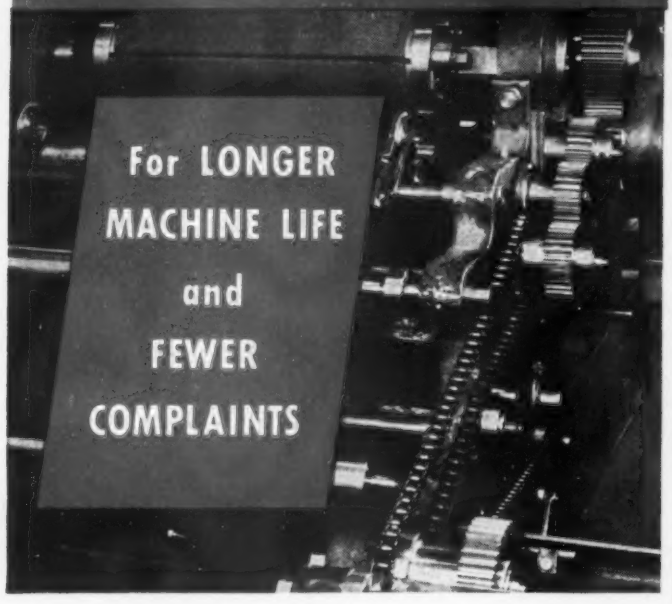
The tracer of the duplicating unit travels over the pattern and controls the position of the tool head; whatever contour exists on the pattern is duplicated on the die block. The Rockford Duplicating Unit is hydraulically operated throughout. Tracer pressure can be adjusted for so light a pattern contact, that low-cost plaster pattern is practical. Write for complete information on Rockford Hy-Draulic Duplicating Unit.



Use SIER-BATH PRECISION GEARS



● Many manufacturers have eliminated one of their most frequent sources of customer complaint by replacing regular commercial gears with Sier-Bath Precision Gears. This has been true especially where gears are subject to continuous operation and high repetitive stresses. By keeping T.A.E. (Total Accumulated Error) to the irreducible minimum, Sier-Bath reduces friction and impact stresses substantially.

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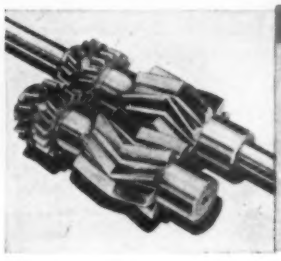

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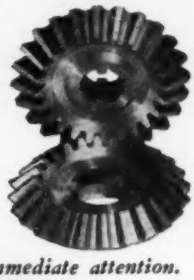

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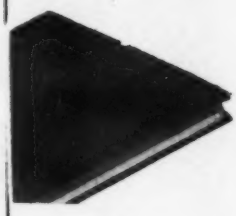

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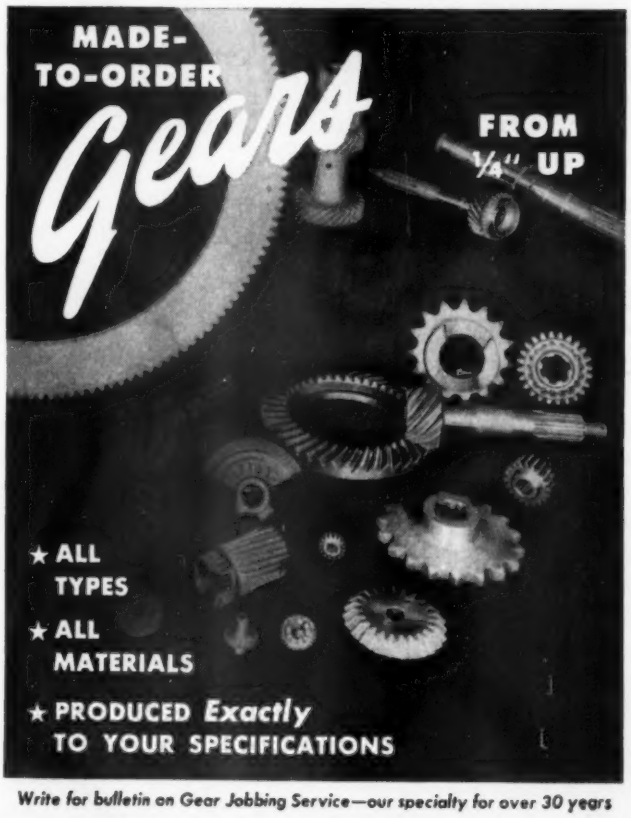

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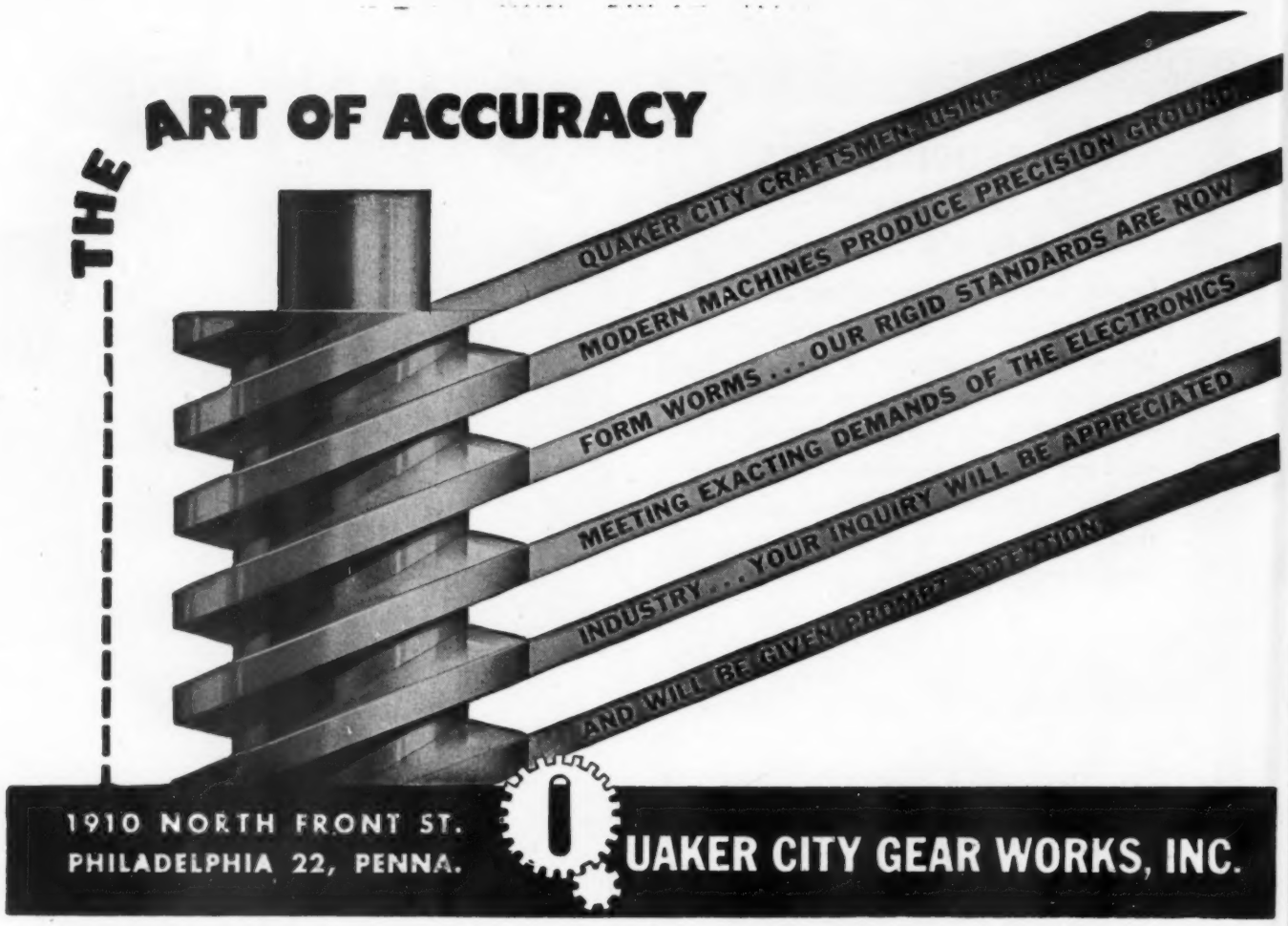
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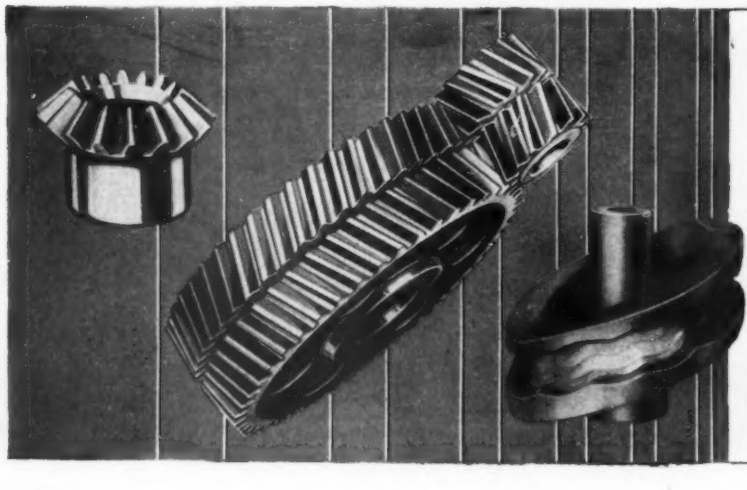

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HARTFORD CONNECTICUT

You can make substantial reductions in the drive costs of your machines and equipment by standardizing on Ohio Stock Gears and Speed Reducers. They save you and your customers money in these 3 definite ways:

1. They **are** stock, saving the extra cost of special orders.
2. You can get them quicker, saving the cost of delays required for special orders.
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Ohio Stock Gears are available in spur, helical, bevel, worm and worm gear types.

Ohio Stock Reducers include ratios from 10-1 to 3200-1; single reduction capacities from 10 HP to 1/6 HP; double reduction capacities from 6000 inch pounds to 25 inch pounds.

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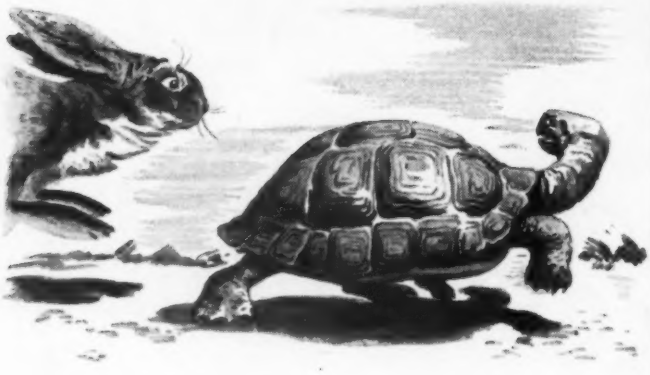
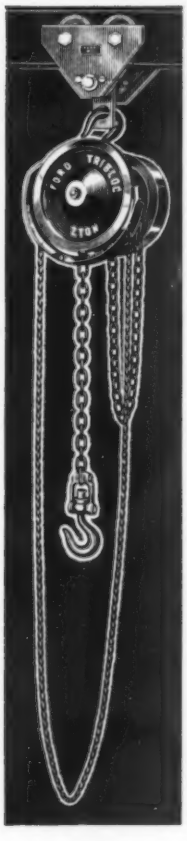
OHIO GEARS

GET ALONG *FASTER!*



WITH
FORD TRIBLOCS



Here is a hoist especially built for constant hard usage. It is ideal where high-speed production counts. There are many reasons why this is true, but one of the chief reasons is the Ford Tribloc's simplicity of design. It has fewer parts than any other hoist in the field, and of course, fewer parts mean less opportunity for wear, greater efficiency, lower maintenance cost. When you buy a Ford Tribloc you get a simple, ruggedly durable hoist that will give fast, dependable service a long time. Capacities: range from ¼ to 40 tons.

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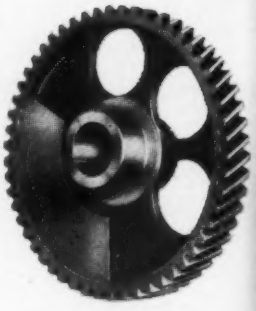
MAXIMUM QUALITY *with* UNIFORMITY

Faster assembly demands gears with uniformity, plus quality. The one perfect answer, providing the rugged performance to meet this exacting demand . . . is found in Cincinnati GEARS, GOOD GEARS ONLY.

Forty years of outstanding quality with precision in serving industrial requirements have proven the wide acceptance of Cincinnati GEARS, GOOD GEARS ONLY. We will welcome the opportunity of working with you in solving your gear problems.



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For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

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HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

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Straight — Spiral Teeth

ALL TYPES
ALL MATERIALS

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BILGRAM GEAR & MACHINE WORKS
1217-35 Spring Garden, Philadelphia, Pa.

SPECIFICATIONS

Bed Area — 40" front to back by 60" right to left
Stroke — 10"
Slide Adjustment — 10" by motor
Shut Height — 28"
Speed — 23 strokes per minute
Diameter of Crankshaft at Main Bearings — 6"

Choosing the Press to Fit the Job

Where the stamping job to be done places only ordinary demands on the press equipment, a Clearing double crank press of the type illustrated here makes an excellent investment. Clearing developed this new family of presses in addition to its well known eccentric gear type machines because they are naturally less costly to build and will perform certain classes of work equally well.

The Clearing SD-660 press is being used, for example, by leading refrigerator and electrical appliance companies in the production of parts having medium depth of draw.

Extraordinary accuracy for presses of this type is assured by Clearing construction. The one-piece welded frame provides perfect distribution of stresses so as to maintain relationships between slide, dies and bed with minimum variation under severe loads. The two cranks distribute the load over a relatively large bed area without any tendency for the slide to "rock." The long, adjustable gibs provide assurance that slide and bed will be constantly parallel under all conditions.

Clearing engineers can quickly tell you whether the demands of your work can best be filled by a crankshaft type press. Since Clearing builds both crankshaft and eccentric drive presses as well as hydraulics, we are in a position to advise you impartially as to the press equipment best suited to your needs. Ask us to help you.

CLEARING

THE WAY TO EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION

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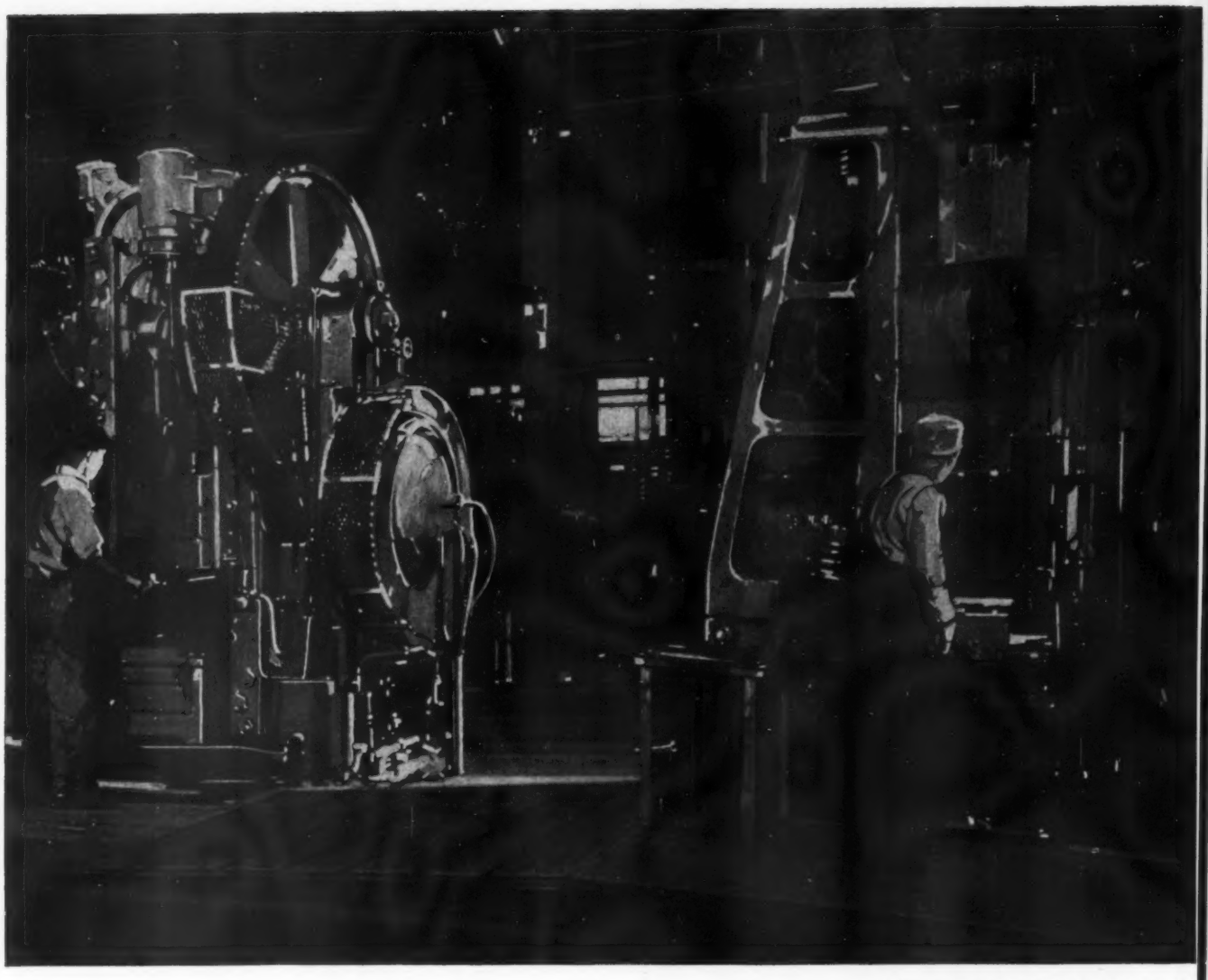

Photo courtesy Gardiner Mfg. Co., Oakland, Calif.

The Ideal Combination – a Chambersburg Hammer and a Chambersburg Steel Side Trimming Press

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CHAMBERSBURG ENGINEERING COMPANY
CHAMBERSBURG, PA.

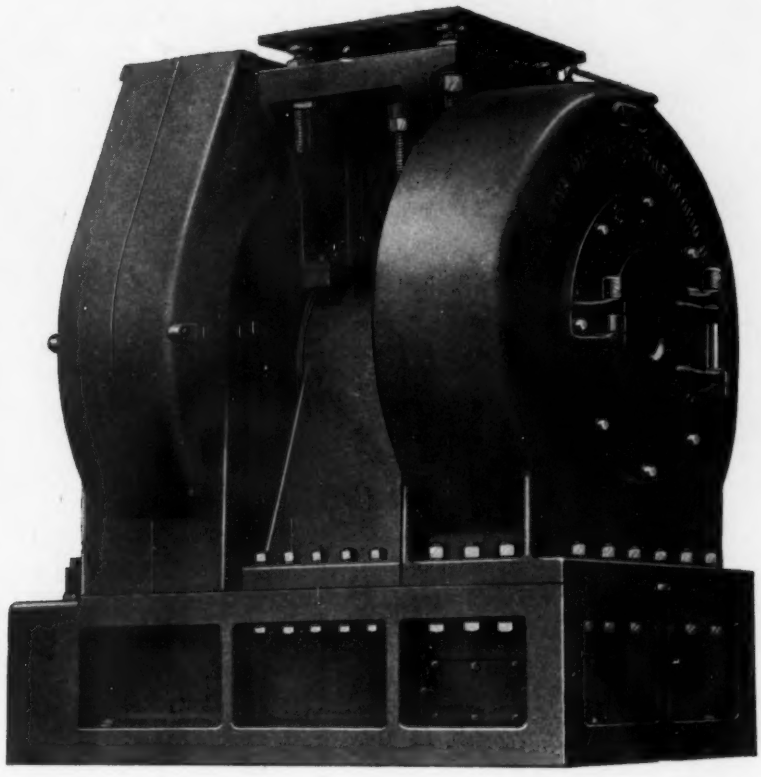
CHAMBERSBURG
Builders of **IMPACT** *Machinery*

For Every Job of Swaging

there's an

ETNA

Rotary Swaging Machine



6000 HAMMER BLOWS OF INFINITE FORCE PER MINUTE

- The dies and hammers rotate around the work, which is held stationary, quickly swaging it to desired size and shape.
- Built to handle the severest work with capacities up to 14 inches in diameter.
- Integral forced coolant and lubrication systems.
- Handle hot or cold work.
- Readily equipped with a variety of feeding devices.
- Cast alloy steel drum mounted on base and bolted to front housing.
- Timken bearings take spindle thrust. Radial ball bearing in rear of flywheel.
- Alloy steel forged, heat-treated and ground spindle.
- A taper fit is used for the flywheel which is further secured by a split nut and key.
- Hammers, rolls and inner ring of heat-treated alloys.
- Motor is mounted over the machine on an adjustable bracket, the power being transmitted by V-belts.

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ERIE BOARD DROP HAMMERS ARE RELIABLE • AND STRONG

HERE is the Erie Type M self-contained electric motor-driven board drop hammer with a top notch performance record in some of the leading forge shops of the world. Top notch performance, because this type Erie Board Drop Hammer occupies less floor space, costs less to run, delivers a harder blow . . . more reasons are contained on page 16 of Bulletin 339.

ERIE

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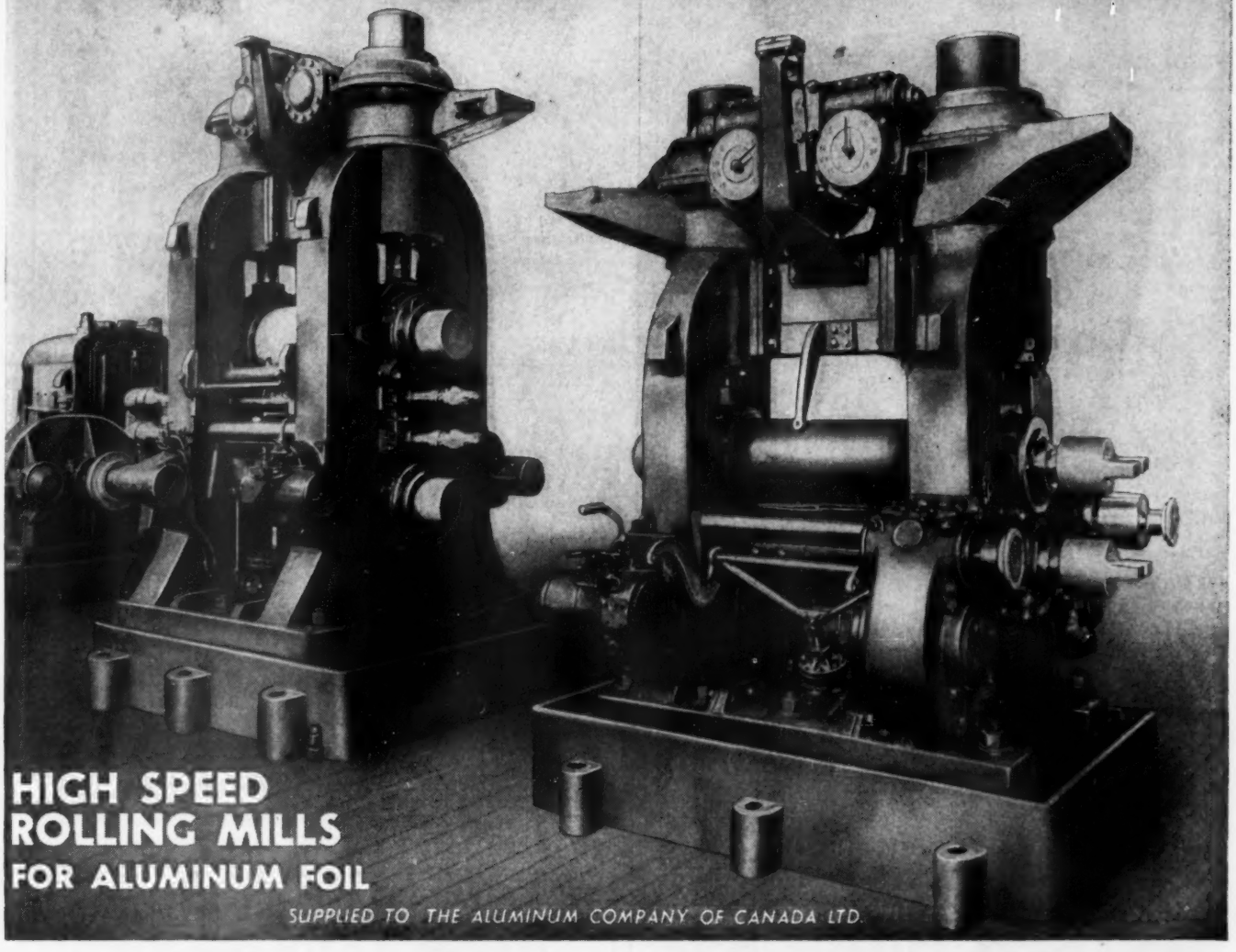
FOR FERROUS AND NON-FERROUS METALS



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Because he can do any anvil forging job quicker—and better. No confusion, no delays.

Every blow just where he wants it—fast or slow, light or heavy. And the job finished with fewer heats.

A direct-geared, electric-motor-driven power hammer, under complete one-man control, provides the "brawn". Strikes like a hand sledge—with the same quick rebound.

Foot controls leave both hands free for work on anvil. Blows delivered on any desired spot—permitting several different operations per heat.

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Shows how this blacksmith's "mechanical helper" saves time, reduces costs, increases shop output. Diagrams. Specifications. Information. Just send the coupon.

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Please send me Blacker Hammer Bulletin No. 56

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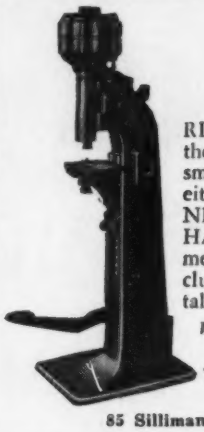
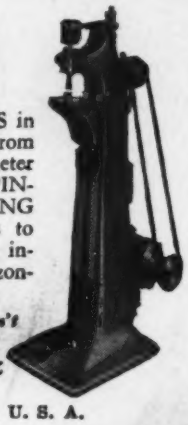


GRANT



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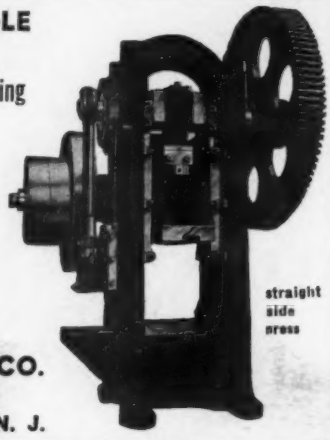
STRAIGHT SIDE SINGLE CRANK PRESSES
for heavy blanking and forming

Heavier classes of blanking and forming work can be handled efficiently and economically on these presses.

Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

Full details on request.



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BAUMBACH *the* DIE SET AUTHORITY

All Baumbach Die-Sets have demountable Leader Pins and Bushings. This exclusive feature permits removing Leader pins for machine work on the die shoe and assures reassembly without loss of alignment. A big time and trouble saver. Write for Catalog.

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FEEDS
AUTOMATIC EQUIPMENT
THE V & O Press Co.
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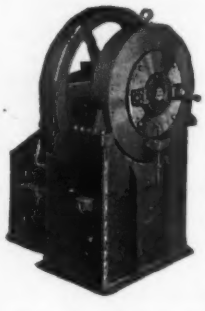

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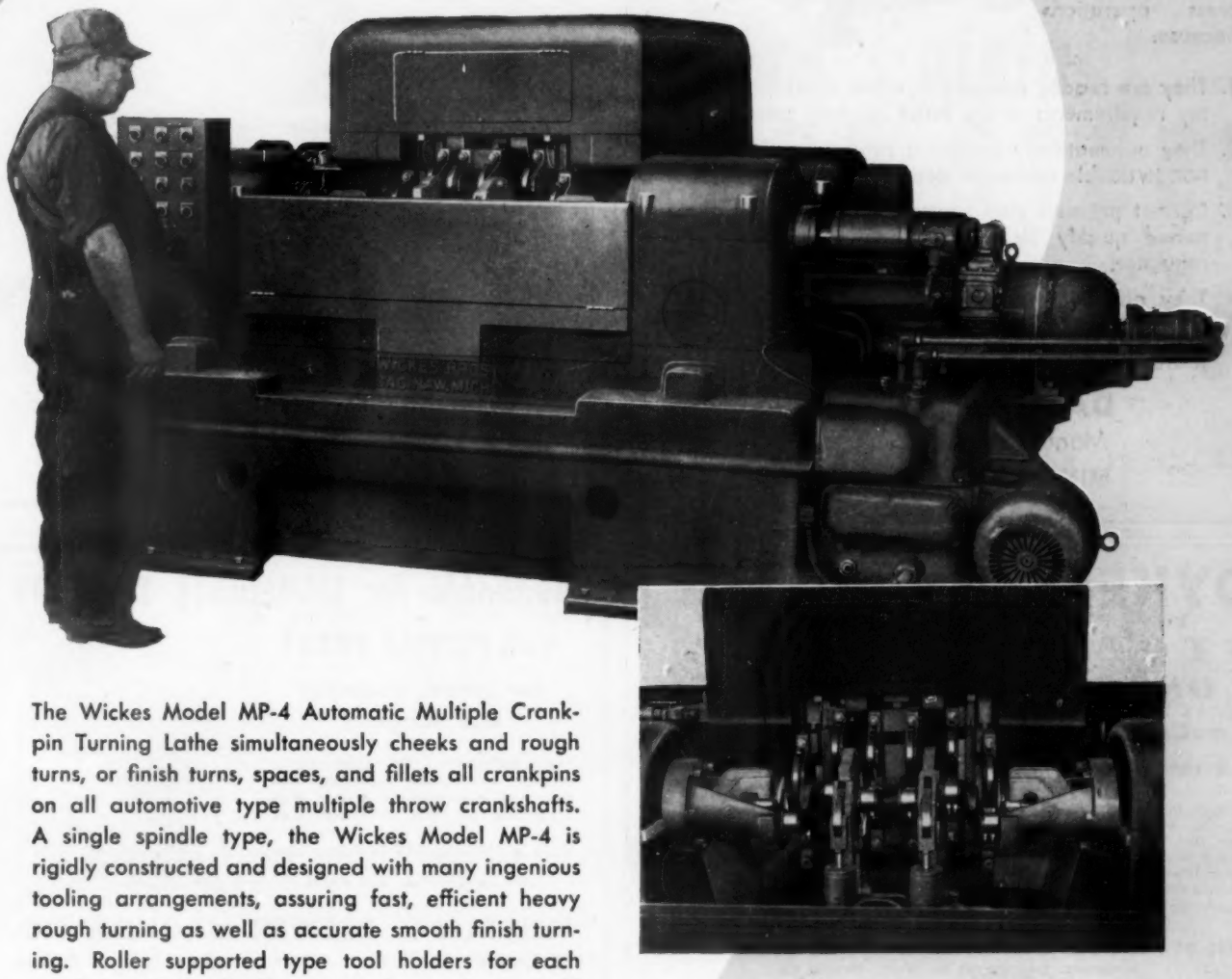
SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

The Torrington Co., Swager Dept.
56 Field Street Torrington, Conn.

WICKES model MP-4 lathe

AUTOMATICALLY MACHINES CRANKPINS ON ALL TYPES OF AUTOMOTIVE CRANKSHAFTS



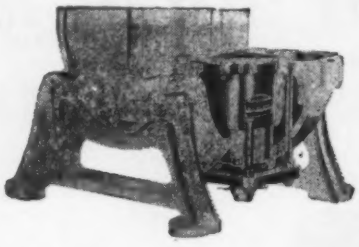
The Wickes Model MP-4 Automatic Multiple Crankpin Turning Lathe simultaneously cheeks and rough turns, or finish turns, spaces, and fillets all crankpins on all automotive type multiple throw crankshafts. A single spindle type, the Wickes Model MP-4 is rigidly constructed and designed with many ingenious tooling arrangements, assuring fast, efficient heavy rough turning as well as accurate smooth finish turning. Roller supported type tool holders for each crankpin. Hydraulically operated pot chucks hold and drive crankshaft from each end. Hydraulically operated steady rests. Hydraulic tool feed. Completely automatic operating cycle. Cam operated synchronized variable speed and feed mechanism maintains both lineal cutting speed and feed per revolution at maximum throughout machining cycle. Transfer switch permits manual operation when desired. Wickes manufactures a complete line of lathes for turning every type of crankshaft. Send us your problems, and our engineers will recommend the Wickes lathe best suited to your needs.

Wickes

WICKES BROTHERS • SAGINAW, MICHIGAN • RECOGNIZED QUALITY SINCE 1854

+INCREASED PRODUCTION
—REDUCED SETUP TIME
=DAYTON ROGERS DIE CUSHIONS

No matter how you figure it Dayton Rogers Die Cushions will assure better results and lower production costs on your punch press operations because:



1. They are readily adapted to either short run quantity requirements or for large quantity production.
2. They automatically convert a press from single action to double action for deep drawing work.
3. Correct pressure pad control on forming dies obtained quickly by simply adjusting the pressure regulator.
4. They afford positive stripping action on all compound, blanking and piercing dies.

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DO YOU GET MAXIMUM DIE LIFE WHEN FORGING

Here is a challenge . . . use the Fiske Hot Die Compound we recommend for your job and compare the results with those obtained from any other product used for the same operation. The results . . . longer die life, more pieces between changes, smoother surface, no carbon formation on dies are our bid for your future business. Fiske Products are sold on a "results" basis. Write today for information.

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Metal Working
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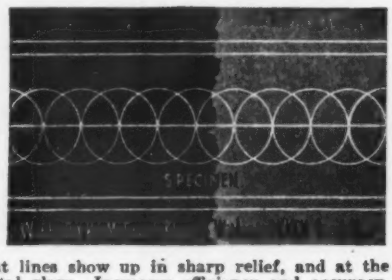
FISKE BROTHERS REFINING COMPANY
NEWARK 5, N. J. *Established 1870* TOLEDO 3, OHIO

DYKEM STEEL BLUE

STOPS LOSSES
making dies & templates



Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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THE DYKEM COMPANY, 2301B No. 11th St., St. Louis, Mo.
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Available for IMMEDIATE DELIVERY

HUB POWER PRESS
for speed, accuracy and economy

These convenient, high speed, power presses will handle materials with ease and convenience. Assures high production of parts at lowest cost.

Made in 4½, 6 and 15 Ton Capacities.

Send for Circulars and Prices.

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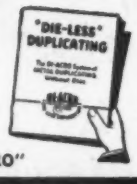
Talk About PRODUCTION Without DIES!

Send for Catalog . . . showing DI-ACRO Precision Machines and many examples of parts made with "DIE-LESS DUPLICATING."



Pronounced "DIE-ACK-RO"

4,000 Parts Per Day With DI-ACRO Bender

Here is an example of "DIE-LESS DUPLICATING" typical of a great variety of formed parts readily made with DI-ACRO Precision Machines,—Benders, Brakes, Shears. Picture shows the finished part formed to die precision, including acute right angle bend. Women operating DI-ACRO units maintain a high out-put on production work.

"Enclosed picture in our plant proves the DI-ACRO Bender will do a real production job. We are making 4,000 completed parts per day which is competitive to most Power Presses." (Name on request.)

DI-ACRO BENDER No. 1 ★

DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

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...Well! We're Gaining!

SPEED CASE STEEL

production is slowly creeping up on orders

—and one of these days we will be able to ship you all the SPEED CASE STEEL you can use. In the meantime, why not get complete information on SPEED CASE? Be ready for SPEED CASE when it's ready for you! It's the only steel possessing such high physicals, unusual ductility, AND cuts like A.I.S.I. B1113 at 250 S.F.P.M. It has a tensile strength of 80,000-90,000 PSI. It replaces B1112, B1113, C1117, C1118, C1019 and MACHINES 40% to 50% FASTER THAN ALL OTHER CASE CARBURIZING STEELS. Prepare NOW for SPEED CASE—

★ Samples and an Expert to Show You How!

Our Speed Case Production Expert will visit your plant after samples are sent you, and show you how to set up your machines and tools to INCREASE PRODUCTION 30 to 100% and still improve the quality of your product. It's a remarkable steel.

ACTUAL PHOTOGRAPH
Speed Case Steel (.20 carbon) 1 inch cold drawn bar tied in a knot, cold, without fracture.

Tear off here **ATTACH TO YOUR LETTERHEAD AND MAIL TO EITHER COMPANY BELOW**

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MANUFACTURERS OF A COMPLETE LINE OF COLD FINISHED CARBON AND ALLOY STEEL BARS

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THE FITZSIMONS COMPANY
YOUNGSTOWN, OHIO

TO HANDLE COMPLEX TOOL GRINDING JOBS

with maximum speed and convenience

use G&L's GRAND RAPIDS No.4

Universal Cutter and Tool Grinder

EXTREME FLEXIBILITY of the No. 4 Universal Cutter and Tool Grinder permits two ways of performing nearly every operation: 1. With the spindle head locked, the sleeve and knee swivel around the column; 2. With the sleeve locked the head swivels on the column.

VERSATILITY of the No. 4 Universal Cutter and Tool Grinder makes all of the following grinding jobs practical and simple:

GEAR CUTTER GRINDING

ANGLE CUTTER GRINDING

INTERNAL GRINDING

CYLINDRICAL GRINDING

FACE GRINDING

FACE MILL GRINDING

END MILL GRINDING

FORMED CUTTER GRINDING

SURFACE GRINDING

HOB GRINDING

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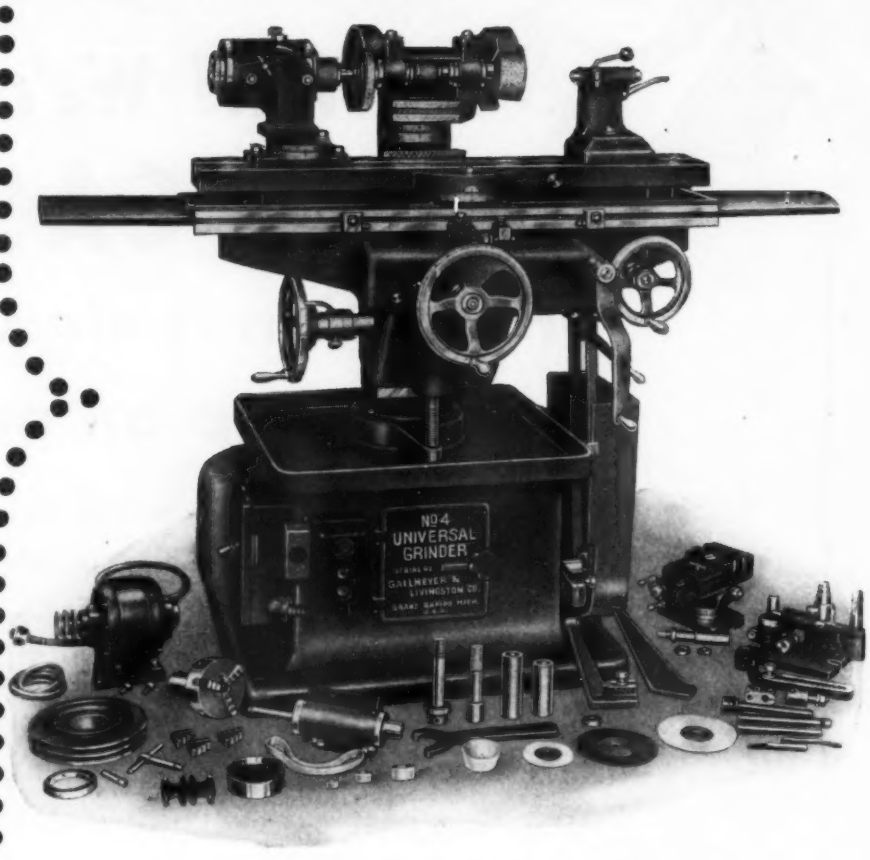


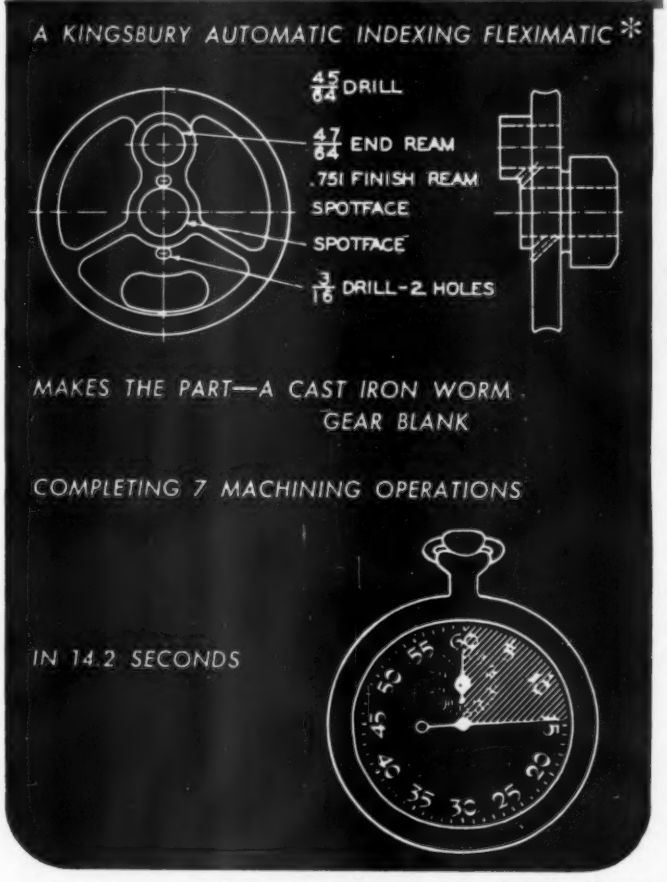
CONVENIENT OPERATION permits control of machine from either front or rear. Power feed providing 6 longitudinal table speeds and wet grinding are available.

What "GRAND RAPIDS" Quality Means: G & L cast their own close-grained gray iron, machine all parts to micrometric tolerances, and precision-assemble grinding machinery of unsurpassed performance. *Grand Rapids* means *top* quality in grinding machinery.

GALLMEYER & LIVINGSTON CO., 330 STRAIGHT ST., S. W., GRAND RAPIDS 4, MICH.

HIGHER PRODUCTIVITY

through the FLEXIMATIC METHOD*



Higher second operation production of cast iron worm gear blanks was the immediate result of the application of Kingsbury multiple machining methods. The *Kingsbury Fleximatic* illustrated consists of eight *standard* Kingsbury drilling heads mounted on a *standard* Kingsbury base equipped with an eight station automatic indexing turret. In a single chucking, all indicated drilling, reaming, and spotfacing operations are completed. A single operator loads rough blanks, trips the machine, and the cycle begins. While the cutting units are working, the operator removes a finished part and reloads the work holder at his station. *The cycle is completed in 14.2 seconds.*

Such multiple machining performance can be duplicated on many parts, yet, because *Kingsbury Fleximatics* are assembled from standard units, you have a special purpose machine at much lower cost. It will pay you to investigate the high production capacity and unusual flexibility of Kingsbury Fleximatics. Let our engineers study your production problems; it does not obligate you.

WE PUT OUR HEADS TOGETHER TO CUT YOUR DRILLING COSTS

KINGSBURY
MACHINE TOOL CORP.
KEENE, NEW HAMPSHIRE

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*** KINGSBURY FLEXIMATIC**

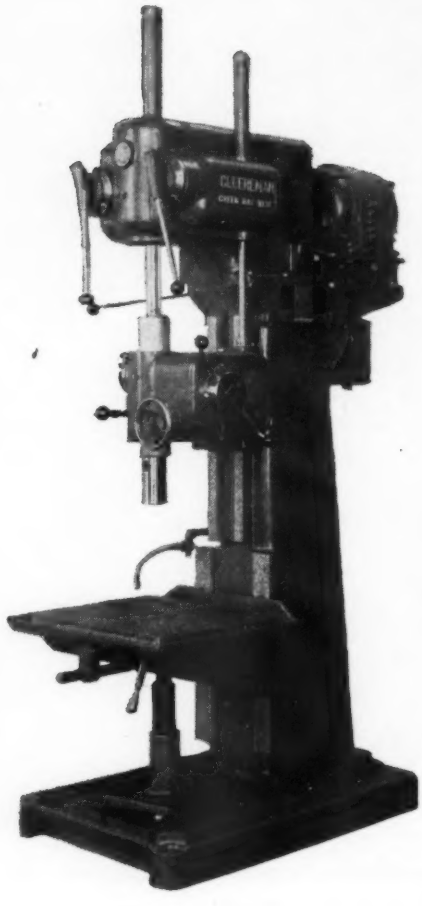
—a special purpose machine for combined automatic operations during a single chucking —the result of Kingsbury engineering ability in the use of low cost *standard* Kingsbury drilling and tapping heads on *standard* Kingsbury bases.

a general purpose machine with the production capacity of a single purpose machine

it's the CLEEREMAN

Sliding Head

DRILLING MACHINE



Yes, the Cleereman Drilling Machine has proved itself economically adaptable to single-piece jobs and to the severe requirements of the production department. It's a machine that produces accurate holes at high speed and at low cost. It is simple to operate and has a wide selection of speeds and feeds.

Write today for descriptive literature giving full details on both Round and Box Column Cleereman Drilling Machines.

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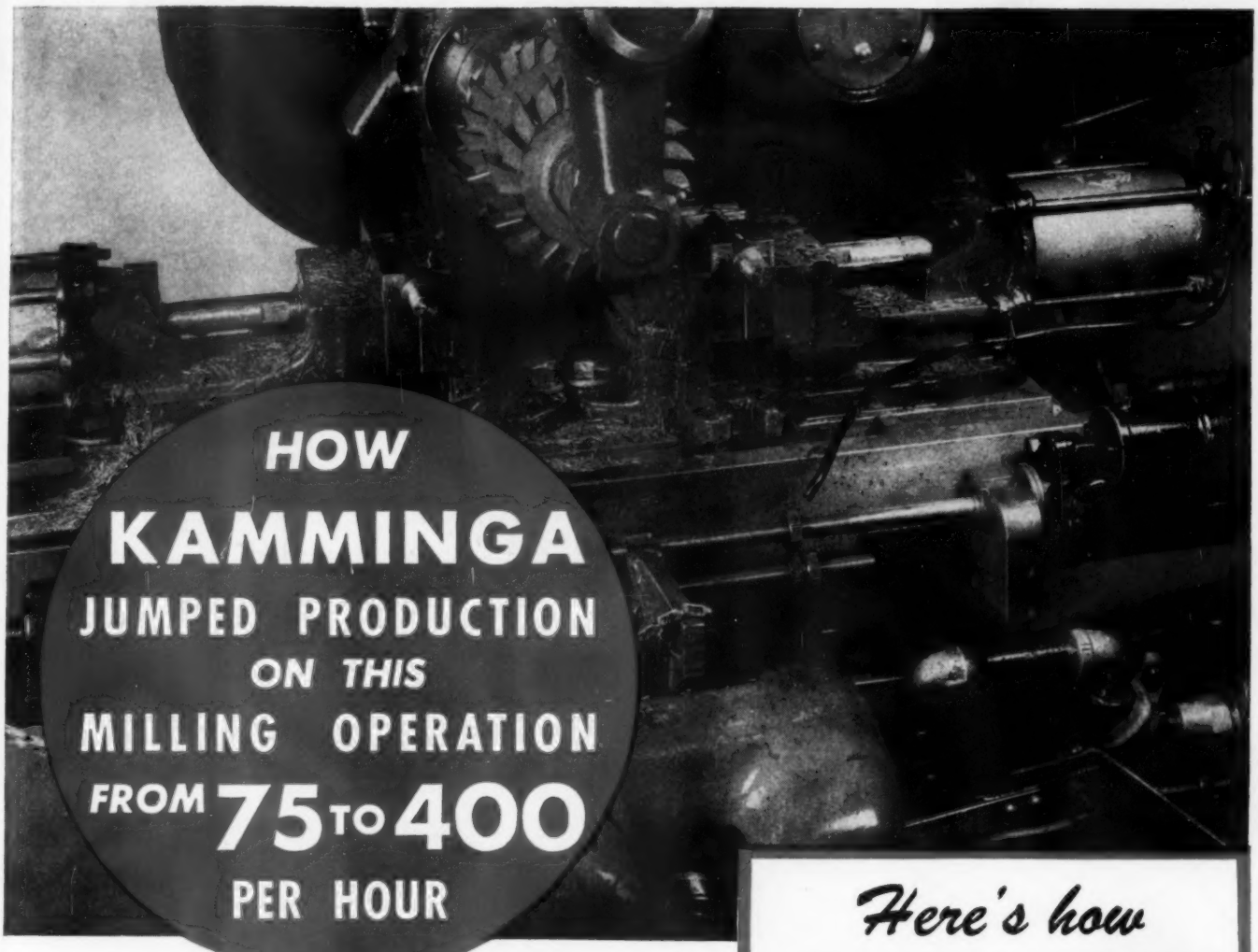
CLEEREMAN MACHINE TOOL CO. Green Bay, Wis.
BUILDERS OF PRECISION JIG BORERS & DRILLING MACHINES



HOW KAMMINGA JUMPED PRODUCTION ON THIS MILLING OPERATION FROM 75 TO 400 PER HOUR

Milling of this anchor pin in the plant of the Kamminga Manufacturing Co., Grand Rapids, had been handled by hand clamping, and hand milling one end at a time. After milling one end, the operation was repeated for the other end. Production averaged 75 complete pieces per hour — 600 per 8-hour shift.

A Bellows Senacon Field Engineer recalled a somewhat similar operation described in one of the Bellows Senacon Foto Facts Files. Working with Kamminga production men they converted a standard Nichols hand mill into a fully automatic unit — a unit that jumped production 533% — from 600 to 3200 complete pieces per shift — increased cutter life 300% — and cut labor costs per piece more than 80%.

The production increase obtained by Kamminga Manufacturing Co. is not unusual. Production increases ranging between 40% and 500% are obtained wherever manual feeding and clamping on milling machines, drill presses or other machine tools is replaced with Bellows Senacon "controlled-air" power.

Here's how IT WAS DONE

A Bellows Senacon "continuous action" Air Motor was installed to traverse the bed against two opposed Bellows Senacon Hydro-Checks (hydraulic resistance units). Two Bellows Senacon Air Vises, synchronized to open and close automatically, were set up to hold the part. The operator loads one vise while a second part is under the cutter. Once the unit is started all operations, except loading and unloading, are continuous and automatic.

Bellows Senacon Co.

AKRON 10, OHIO

Would you like the current Foto Facts File without cost or obligation? *Send coupon, today.*

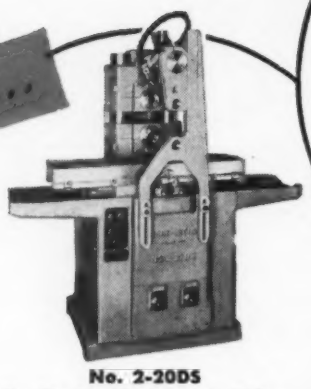
Please send me the current Bellows Senacon Foto Facts File, and the detailed story of the milling operation described in the December 5 issue of American Machinist.

Name.....

Company.....

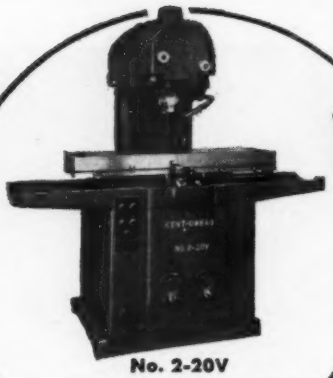
Address.....

Rugged...



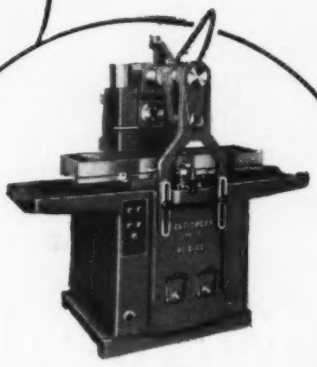
No. 2-20DS
Double Spindle for two milling operations at same time . . . 20" table travel . . . 42" x 12" table.

Efficient...

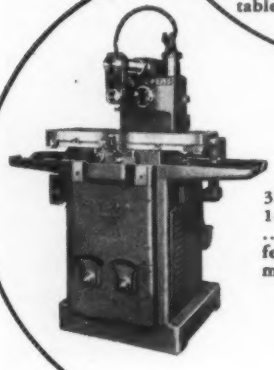


No. 2-20V
20" table travel . . . vertical spindle with speed range 32 to 1284 R.P.M. . . . 42" x 12" table.

Simple...



No. 2-20
20" table travel . . . 42" x 12" table . . . full automatic hydraulic table feed.



No. 1-14
32" x 9" table . . . 14" table travel . . . hydraulic table feed . . . full automatic cycle.

Standard
hydraulic and hand machines

KENT-OWENS

Milling Machines

Write for Bulletins. Kent-Owens Machine Co., Toledo, Ohio.

KENT-OWENS REPRESENTATIVES

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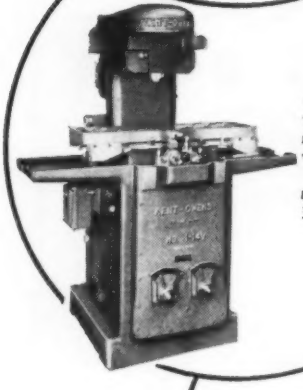
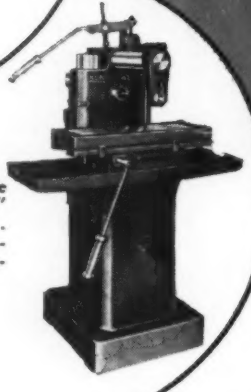
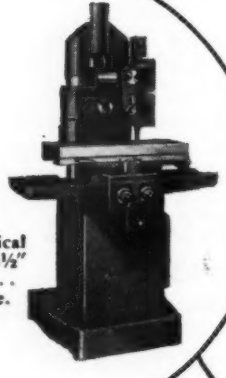


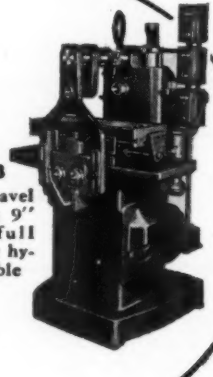
No. 1-14V
14" table travel with full automatic cycle . . . vertical spindle with speed range 115 to 3000 R.P.M.



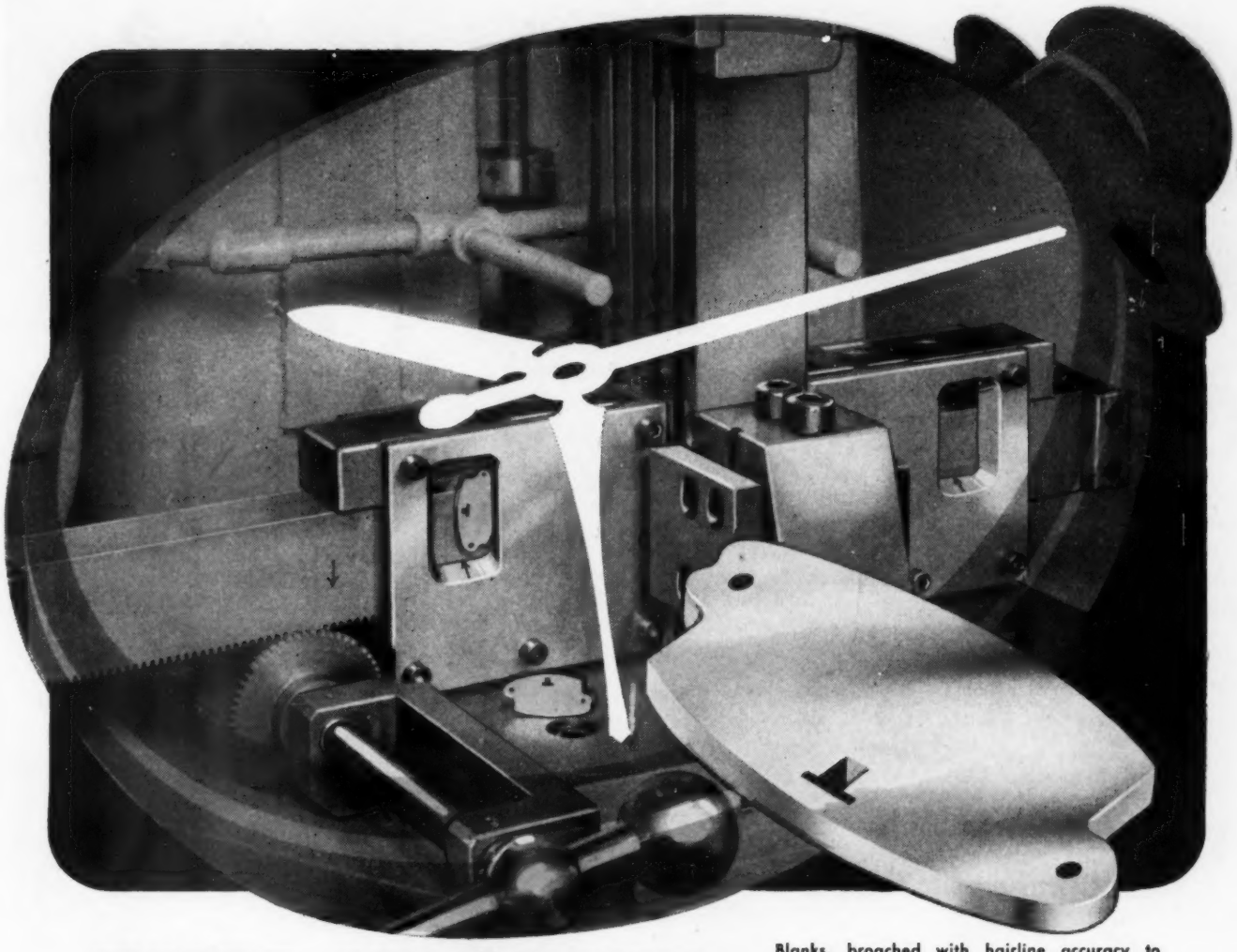
No. 1-M
Hand feed to table and head . . . 25" x 9" table . . . 1 H.P. . . . head counterbalance is adjustable.



No. 1-V
Hydraulic vertical head feed . . . 5½" head travel . . . 25" x 9" table.

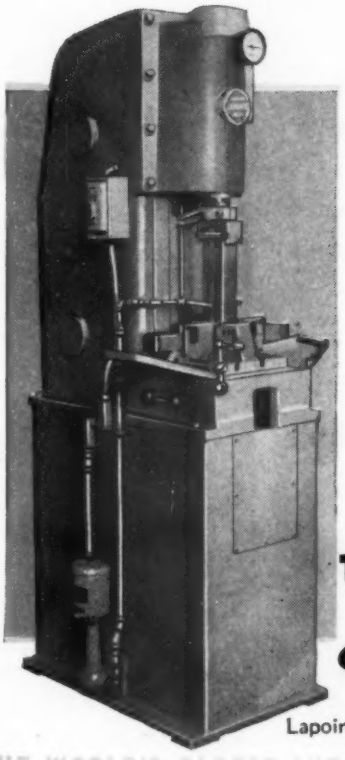


No. 1-8
8" table travel . . . 25" x 9" table . . . full automatic hydraulic table feed.



TIME MACHINE

Blanks, broached with hairline accuracy to produce watch gear boxes at an amazingly increased production rate for precision parts.



Lapointe 2½ ton 12" Bench Press.

SPLIT-SECOND PERFORMANCE in the broaching of watch gear boxes has given every minute a full 120 seconds of production! Eight hundred pieces an hour represents only 80% capacity of this Lapointe broach and fixture, yet this is a 100% increase over previous production methods.

Two parallel surfaces of four blanks are broached in one cycle of this 2½ ton Bench Press. Equipped with an unusual, manually operated fixture, tolerances of .0002 are achieved with the accuracy characteristic of fine watches.

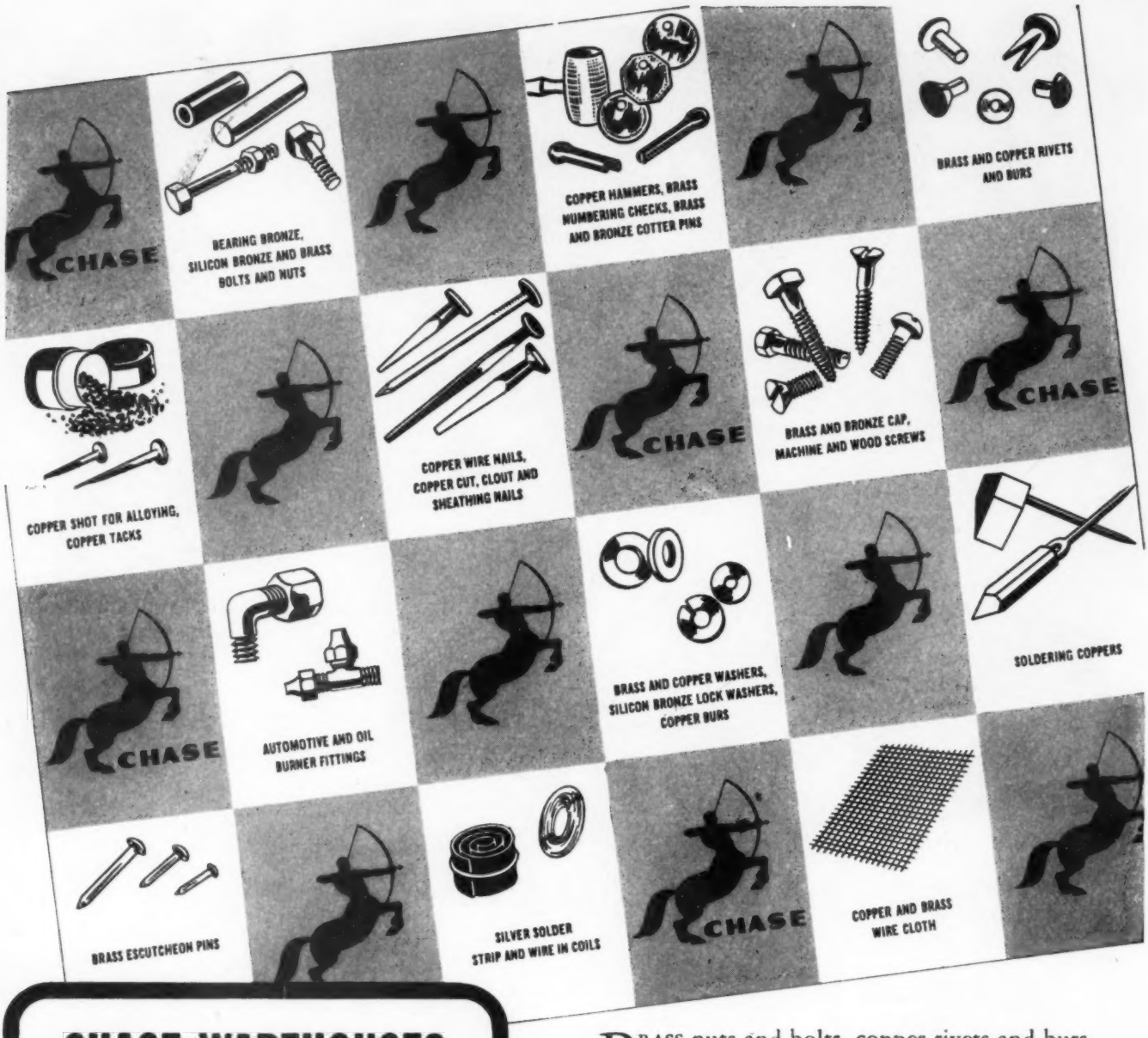
Where minutes matter and parts must be precise, Lapointe broaching can give you production and precision comparable to that achieved for the watchmaker. Lapointe's ingeniously devised fixtures immeasurably extend the application of the broaching process.

THE Lapointe MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U.S.A.

Write to The Lapointe Machine Tool Company today for further information on this adaptable, high-speed process. Our engineers will gladly show you the possibilities of broaching in your plant.

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES


BEARING BRONZE, SILICON BRONZE AND BRASS BOLTS AND NUTS
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BRASS AND COPPER RIVETS AND BURS
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BRASS nuts and bolts, copper rivets and burs —all these and more—are carried in stock at Chase warehouses.

There are 20 Chase warehouses coast to coast. Phone the one nearest you. If they do not have what you want in stock, they'll try to get it for you from one of the many other Chase warehouses.

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BRASS & COPPER CO.

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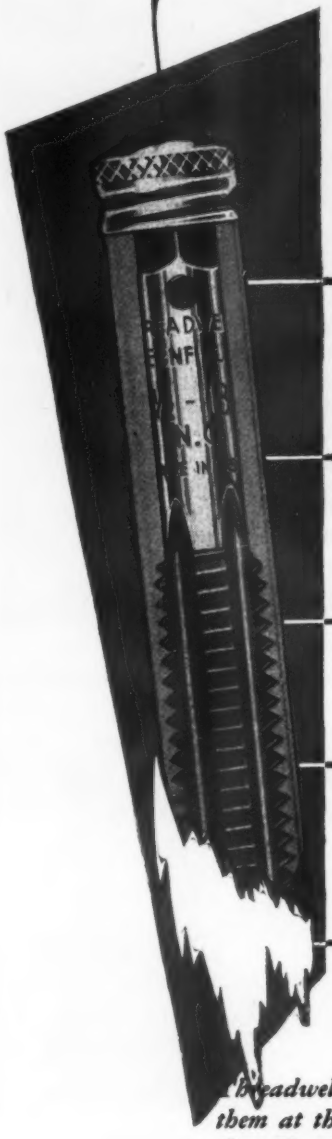
This is the Chase Network—handiest way to buy brass — INCORPORATED —

ALBANY† ATLANTA† BALTIMORE BOSTON CHICAGO CINCINNATI CLEVELAND DETROIT HOUSTON† INDIANAPOLIS JACKSONVILLE† KANSAS CITY, MO. LOS ANGELES MILWAUKEE MINNEAPOLIS NEWARK NEW ORLEANS NEW YORK PHILADELPHIA PITTSBURGH PROVIDENCE ROCHESTER† SAN FRANCISCO SEATTLE ST. LOUIS WASHINGTON† *(†Indicates Sales Office Only)*

Yours *At No Extra Cost when you specify* THREADWELL TAPS



"i-dot-ified"—for easy, instant identification of the type of tap —*red* dot for cut thread, *white* dot for commercial ground, *blue* dot for precision ground.

"tap-capsuled"—in individual metal-capped, transparent plastic tubes that provide perfect protection for clean, ground threads and make it easy to select the right tap before unwrapping and handling.

with polished flutes—that provide extra protection against chip clogging and reduce danger of breakage.

"greaseless rust-proofed"—by a special Threadwell process which keeps them clean, dry and shining—never messy or sticky.

"cold-tempered"—at 120° below zero to give them the hardness without brittleness to produce better threads and more of them in steels, cast iron, alloys, plastics and other abrasive materials.

Threadwell Taps are sold exclusively through Mill Supply Distributors. Ask for them at the Threadwell distributor's in your locality. You might as well enjoy these Tap extras since they cost nothing extra.

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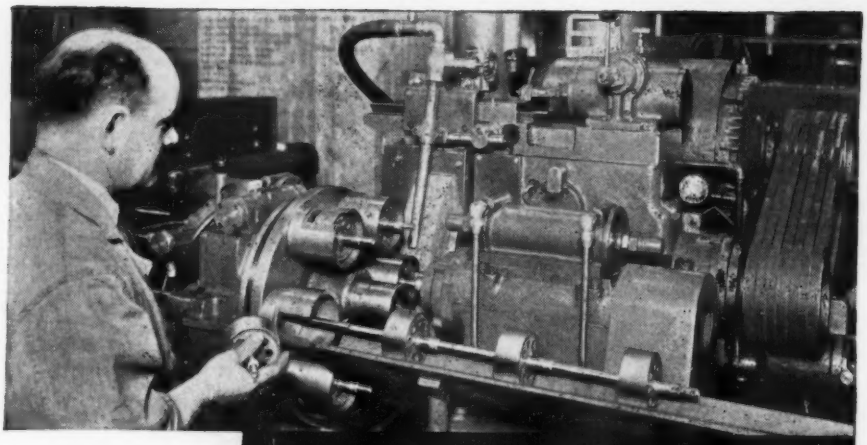
CALIFORNIA OFFICE, THREADWELL TAP & DIE CO. OF CALIF., 1322 SANTA FE AVE., LOS ANGELES 21

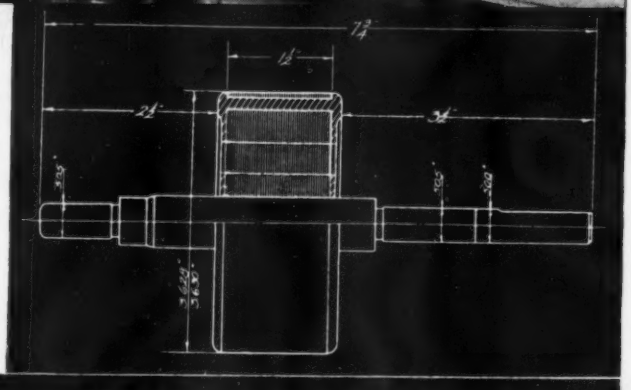
Cylindrical Grinding Automatically

High productive rate by ARTER No. 135



A drum or carrier, hand loaded, brings the work between two live work spindles. Either work centers or collets pick up and drive the work. Dogging and handling time saved. A wide wheel, oscillating slightly, plunge-cut grinds the work.

The grinding of the diameter of the laminations of an armature for a washing machine motor is one of the many jobs on which this machine is giving typical ARTER satisfaction. Production—200 pieces per hour. The central taper shaft diameter is ground before assembly with a production rate of 300 per hour.



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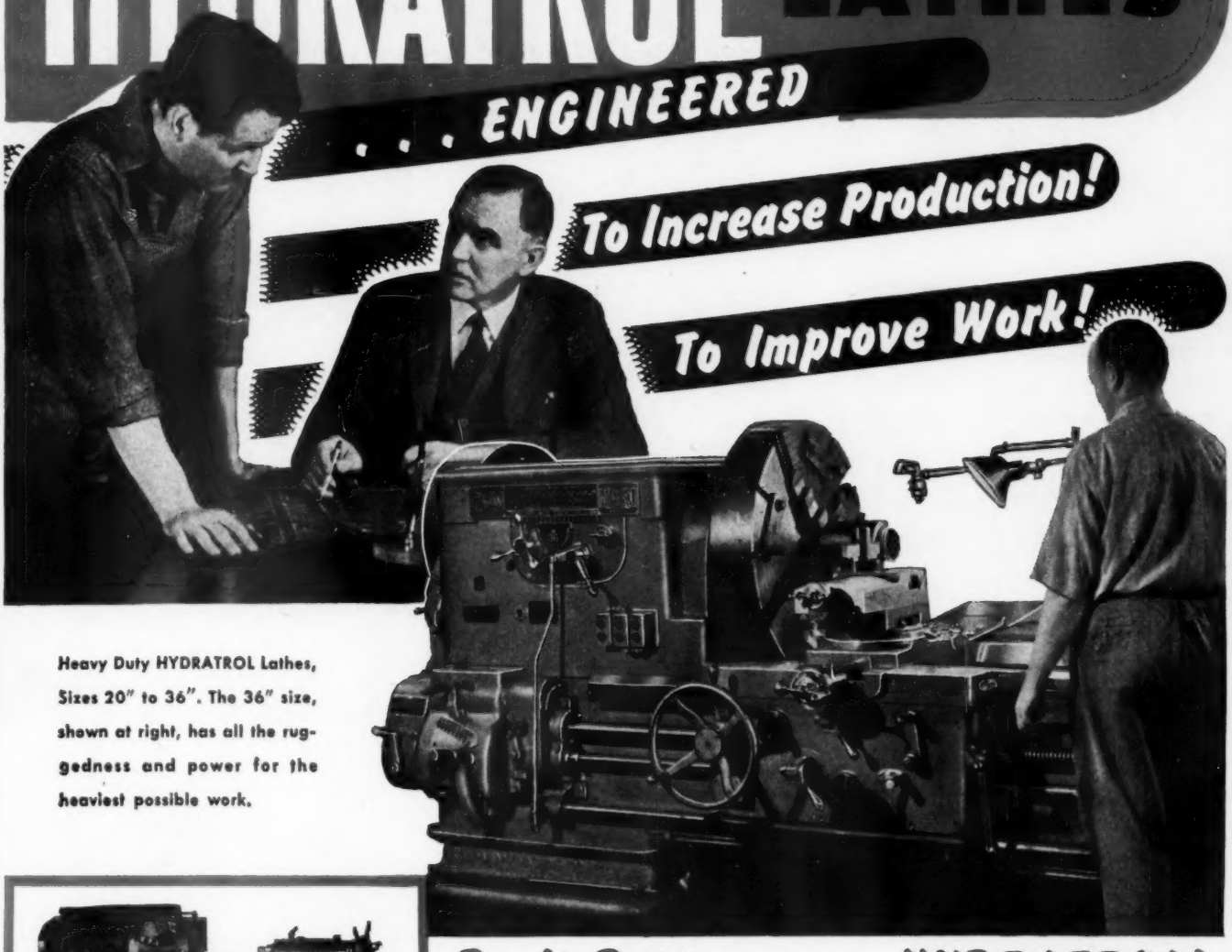
DAVIS & THOMPSON COMPANY

MANUFACTURERS MACHINE TOOLS, MICROMETERS AND GAGES

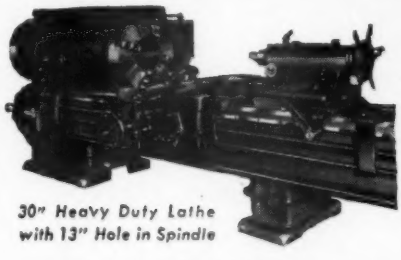
MILWAUKEE WISCONSIN

HYDRATROL LATHES

. . . ENGINEERED To Increase Production! To Improve Work!



Heavy Duty HYDRATROL Lathes, Sizes 20" to 36". The 36" size, shown at right, has all the ruggedness and power for the heaviest possible work.



30" Heavy Duty Lathe with 13" Hole in Spindle

LARGE HOLLOW SPINDLE TYPE

5 SIZES—18" to 36"

Small	18" up to 7⅛" Hole
Medium	24" up to 12⅛" Hole
Large	27" up to 13⅛" Hole
Large	30" up to 14⅛" Hole
Large	36" up to 16½" Hole

(Standard type lathes, 16" to 36")

Do It Better - on a HYDRATROL!

IN hundreds of plants — under all sorts of conditions — LEHMANN HYDRATROL LATHES have invariably brought about faster production, better work, lower costs.

Look around your own shop — you may find a number of machining jobs which possibly could be done *better* on a Heavy Duty Type of HYDRATROL LATHE, as pictured above. Send us prints of these unusual, difficult, or too-costly machining jobs, for a specific, time-and-money-saving recommendation.

MOVIE SOUND FILM, in natural colors, available, showing functions of Hydratrol Lathe, advanced construction features, and production machines in operation. Ask the Lehmann representative for a showing.

Lehmann MACHINE COMPANY

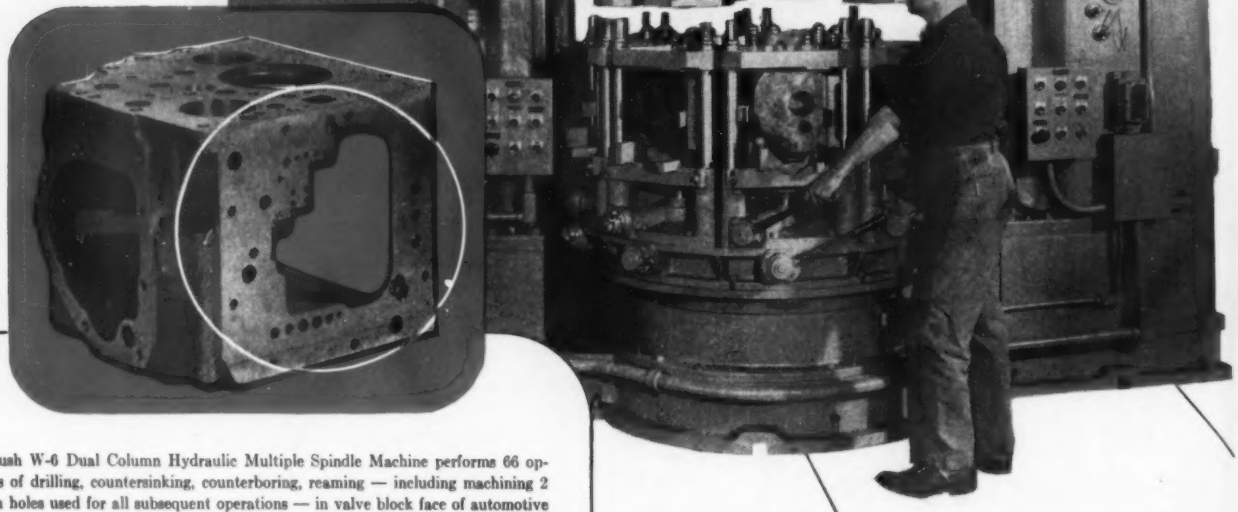
CHOUTEAU AT GRAND • • • ST. LOUIS 3, MISSOURI

Focus on Speed!

performing 3630 operations on 55 transmission cases each hour MEANS PROFITS!

Yes - to meet today's and tomorrow's competition in profitable, high speed production BAUSH MULTI-OPERATION MACHINE TOOLS lead the field in fast, accurate, economical manufacture with minimum maintenance and upkeep.

Our years of experience can solve your production problems - Wire, Phone or Write Us.



Baush W-6 Dual Column Hydraulic Multiple Spindle Machine performs 66 operations of drilling, countersinking, counterboring, reaming — including machining 2 location holes used for all subsequent operations — in valve block face of automotive transmission case — producing 55 cases per hour for leading automobile manufacturer.

Machine has 9 index stations (1 loading and 8 working). Base of welded steel and columns of cast iron are rigidly reinforced and treated for stresses. Column ways and saddle are accurately aligned and taper gibs provide compensation for wear.

Hydraulic pumps and cylinders give 18" maximum stroke with adjustable feed rates. 2 precision ball-bearing fixed center heads, of flower pot design arranged for pick-off gears, furnished with 66 spindles. Each head accurately counterbalanced from inside column and powered by 15 H.P. motor.

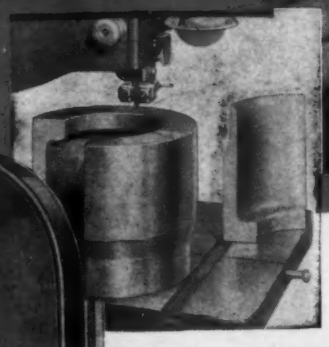
50" diam. semi-automatic rotating table, arranged for 9 indexes, is hydraulically operated with hydraulic tank built into rear of base.

Fixture has 9 holding units — each designed for easy loading, rigidity and accuracy in clamping parts — assembled to a plate mounted on the rotating table. Bushing plates for guiding all tools are suspended from heads of machine, resting and registering on each holding fixture.

BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

● *Right:* In addition to using it for cutting cast iron jig and fixture bases 1½" and 2" thick to segments 6" thick, one plant uses its Delta Metal-Cutting Band Saw for all miscellaneous sheet-metal cutting, such as templates, structural shapes, parts for experimental machines, etc.

● *Below:* A machine-shop superintendent says that the Delta Metal-Cutting Band Saw saved its cost on the first few jobs of cutting draw-die segments as shown here.



4 metal-cutting speeds
•
1 wood-cutting speed

DELTA*
Metal-Cutting Band Saw
...quickly pays for itself on many applications

★ Cutting almost any material . . . steel, plastics, mica, fiber, carbon, vulcanite, etc.

★ Cutting templates.

★ Sawing off tool, die, and fixture stock.

★ Trimming gates in iron, brass, aluminum.

The low-cost Delta 14" Metal-Cutting Band Saw is an economical general-purpose unit for use in machine shops, tool rooms, experimental shops, foundries, pattern shops, and other places where many different materials must be cut.

Famous Delta construction features assure long, trouble-free life:

- Lubricated-for-life New Departure ball bearings.
- Simple, foolproof gear drive.
- Massive table mounted on double trunnions for rigidity.
- Guides that can be independently adjusted to micrometer accuracy.
- Guide controls at front of table for safety.
- Completely guarded, safety-type wheels, rimmed for easy tire renewal.
- Many other advantages that benefit you.

Enjoy the economy and versatility of the Delta Metal-cutting Band Saw. Install it in your plant. See your Delta distributor — listed under "Tools" in the classified section of your telephone directory.

Mail coupon below for free Bulletin A-28.

• • •

Delta tools are typical products of the American way of doing business. In America, we use tools to create more and better things at lower cost than in any other country, and in this way provide better living — for only as people work together to produce more can they have more to enjoy.

Delta Manufacturing Division
Rockwell Manufacturing Company
Milwaukee 1, Wisconsin

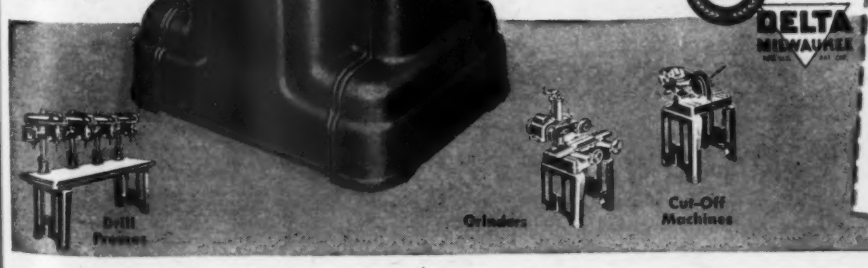
Specifications

Capacity:	
Blade to frame	13¾"
Under guide	6¼"
With height attachment (available separately)	12¼"
Speeds:	
With 1725 RPM motor	125, 175, 250, and 340 ft. per min.
With 1140 RPM motor	80, 114, 160, and 220 ft. per min.
(For woodworking there is one speed only of 2200 ft. per min., using a 1725 RPM motor.)	
Table:	
Dimensions	14" x 14"
Tilt	45° right; 10° to left.
Table from floor	42¾"
Overall height	65½"
Width	16¼"
Front to back	24¾"
Blades	93½" regular; 105" with height attachment

M-20

*Trade Mark Reg. U.S. Pat. Off.

ROCKWELL DELTA MILWAUKEE



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DELTA MANUFACTURING DIVISION
609N E. Vienna Ave., Milwaukee 1, Wisconsin

Please send me Bulletin A-28 on Delta Metal-Cutting Band Saw.

Name.....
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Company.....
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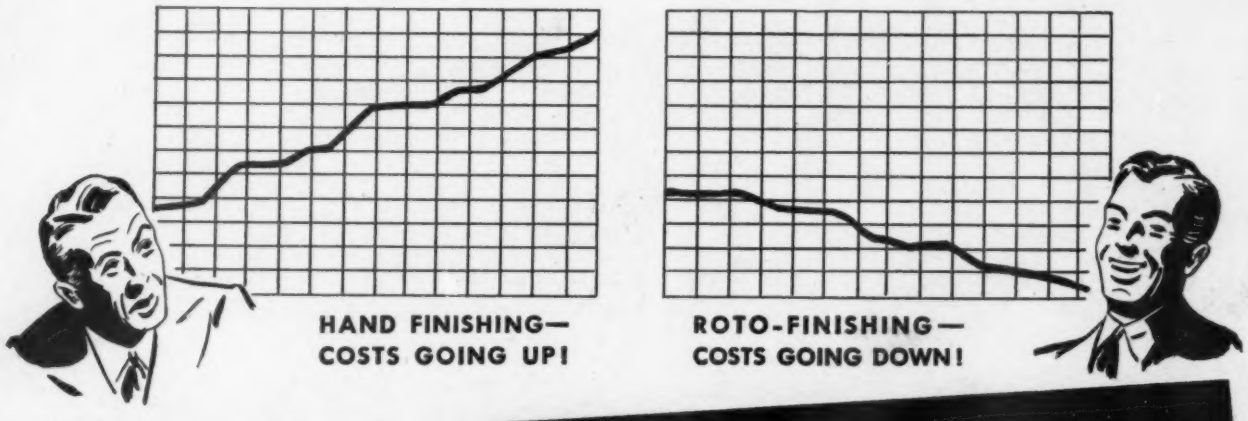
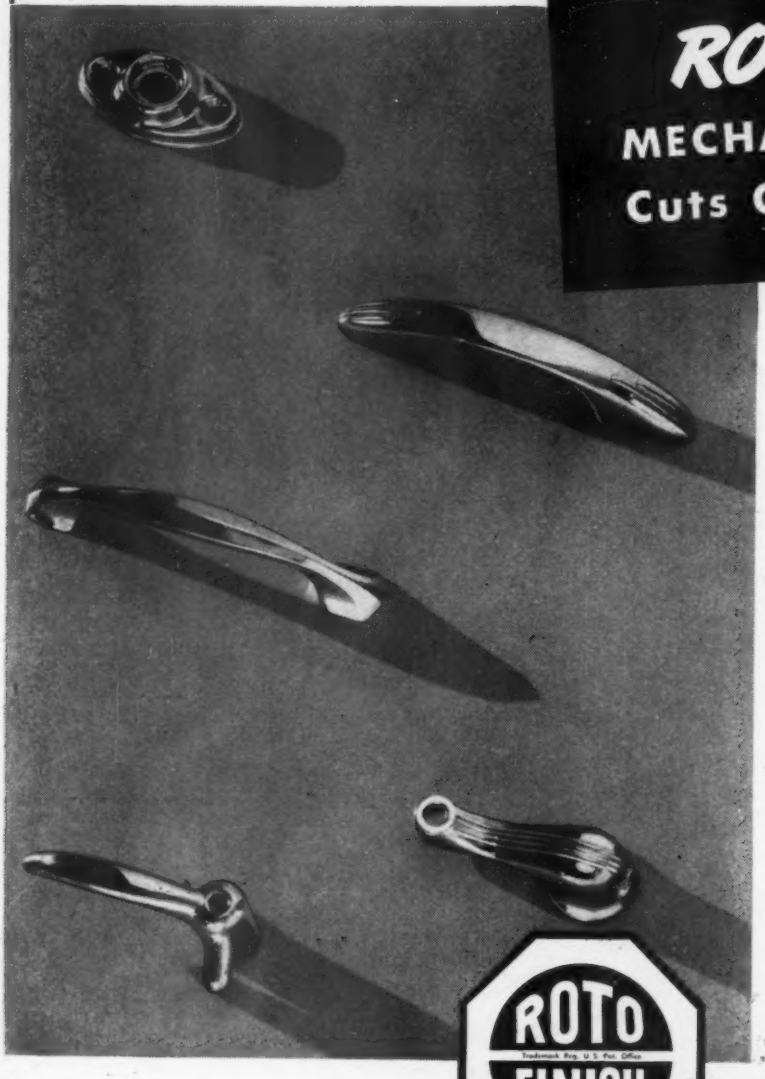
WHICH CHART APPLIES TO YOUR FINISHING DEPARTMENT?





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MECHANICAL FINISHING Cuts Costs! Saves Time!

PUT your Finishing Department on a production basis by installing Roto-Finish — the accepted process in leading plants to produce mechanically a finish comparable to hand buffing, on many parts of aluminum, brass, magnesium, steel, stainless steels, and die cast alloys.

Roto-Finish is mechanical — eliminating hand operations, and stepping up production time by processing quantities of parts mechanically. Roto-Finish is accurate—a controlled action that furnishes a uniform finish exactly to predetermined standards.

Quantities of parts large or small can be finished in one operation — and de-burred as well. Roto-Finish produces a surface well prepared for plating. It finishes parts for plating weighing a fraction of an ounce and up.

Take advantage of our offer to process your parts and furnish complete information. No obligation. THE STURGIS PRODUCTS CO., 613 Jacobs Street, Sturgis. Michigan.

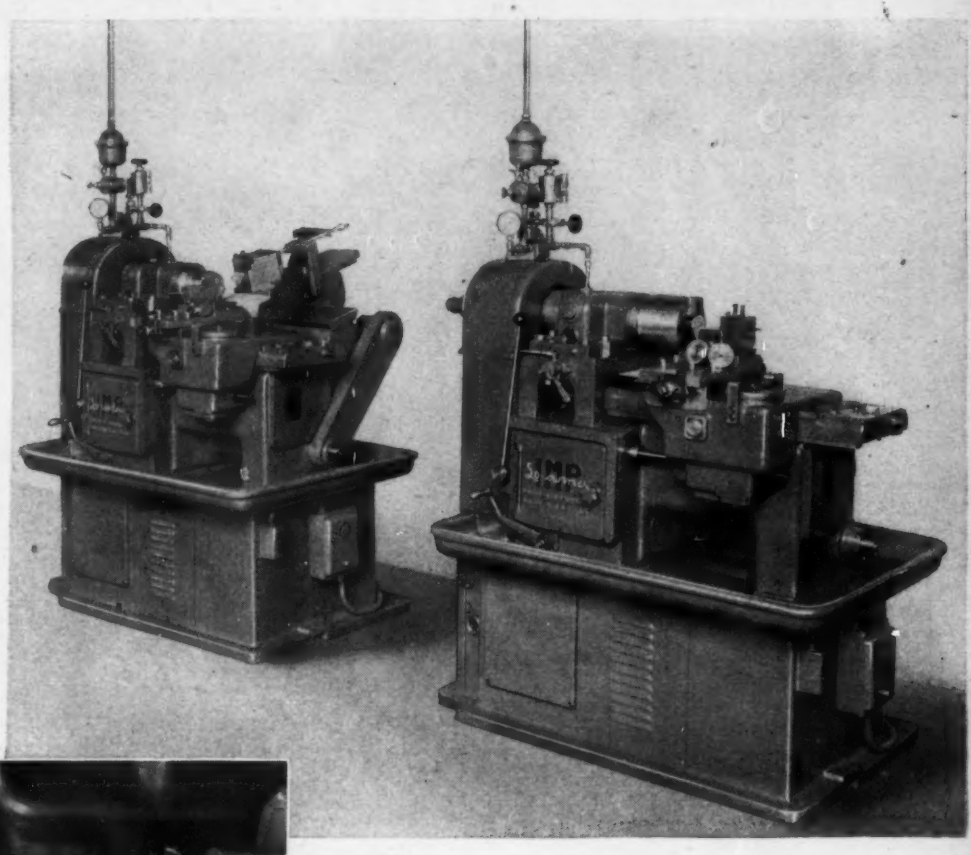
ROTO FINISH
Trademark Reg. U. S. Pat. Office

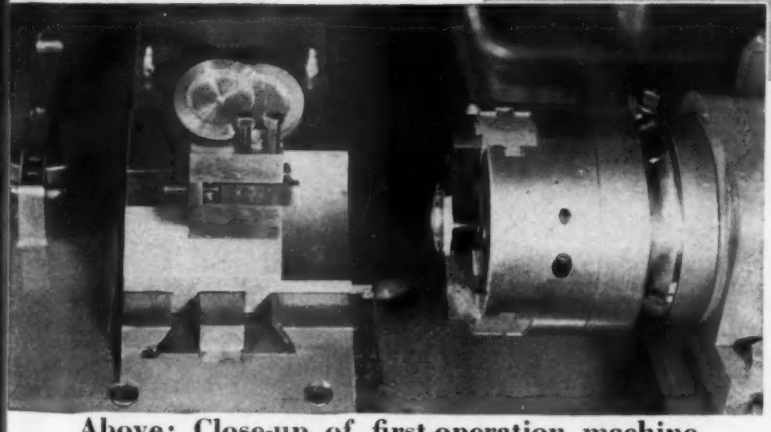
THE UNIFORM MECHANICAL PROCESS
FOR GRINDING • DE-BURRING • POLISHING HONING • COLORING

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK

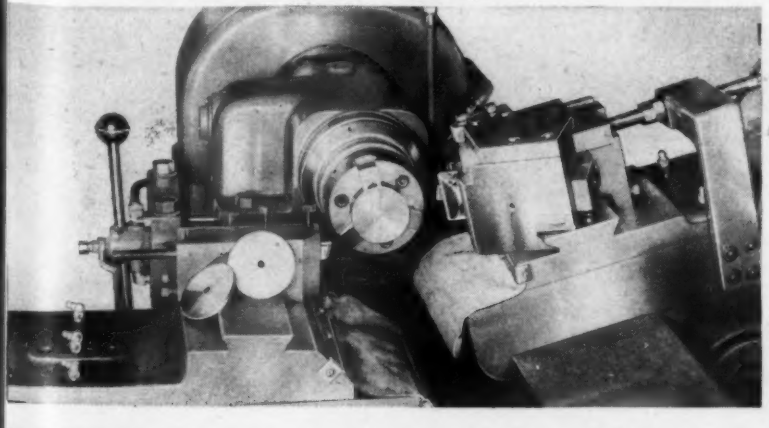
IMP LATHES MACHINE BRONZE DISCS ON 2-OPERATION SET-UP





Above: Close-up of first-operation machine.

Below: Close-up of second-operation machine.



Problem: To face, undercut, turn and groove bronze discs on a production basis.

Solution: Two Lo-swing IMP Lathes were selected for this job since the size of the work (2-5/16" dia. x 3/16") was within the capacity of these high-speed machines. The first-operation IMP, seen at right above, locates the work from a previously-bored hole. An air-operated, compensating chuck grips it on the O D. Tools on the front cross slide face and undercut.

The second-operation IMP machines the reverse side of the part, again locating from the hole and driving with a compensating, internal jaw chuck. A tool on the front carriage turns the O D while tools on the back attachment face and groove. The facing tool relieves on the return stroke so as not to score the work.

Estimated production is 185 pieces per hour on the first-operation machine and 160 on the second—at 85% efficiency. All tools are cemented carbide.

MICROHONING

is the Quicker, Better, Lower-Cost Method

A DIESEL FUEL INJECTOR BODY
.375" DIAMETER x 2½" LONG

1st Honing Operation—in the "green" —Removes an average of .012" in 65 seconds.

Part is then Nitrided to 70-72 Rockwell C.

2nd Honing Operation Removes an average of .0015" in 60 seconds.

Roundness and taper is held within .0001".

Bow is held within .00007".

Microhoning speeds operation in final machining of either green or hardened parts.

MICROMATIC HONE CORPORATION • DETROIT 4, MICHIGAN

DISTRICT FIELD OFFICES: 1323 S. Santa Fe, Los Angeles 21, Cal. • 194 Dalhousie St., Brantford, Ont., Can. • 616 Empire Bldg., 206 S. Main St., Rockford, Ill. 501 Harries Bldg., 137 No. Main St., Dayton 2, Ohio • 927 A—M & M Bldg., P.O. Box 981, Houston 2, Texas • Room 514—129 Church St., New Haven 10, Conn.

For the

SPECIAL

DRILLING and TAPPING JOB...

BARNESDRIL PRODUCTION UNITS INCREASE MARGIN OF PRODUCTIVITY AND LOWER COSTS

This prominent washing machine manufacturer secured increased production with resultant lowered manufacturing costs using two special BARNESDRIL Production UNITS for drilling and tapping miscellaneous holes in transmission cases.

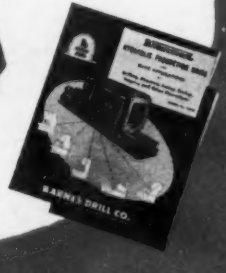
One BARNESDRIL Production UNIT performs both vertical and horizontal drilling and tapping operations on one side of the workpiece. The second BARNESDRIL Production UNIT performs similar machining operations on the other side of the part.

BARNESDRIL PRODUCTION UNITS FLEXIBILITY AFFORD GREATER ECONOMIES

Completely self-contained, BARNESDRIL Hydraulic Production UNITS have an unusual flexibility which permits their arrangement in any single or combinations of vertical, horizontal or angular positions; or they can be grouped around a rotating indexing table or drum for the most efficient handling of the work. Complete machines for either *standard* or *special* drilling, reaming, facing, boring and or tapping operations are designed and built for your specific requirements.

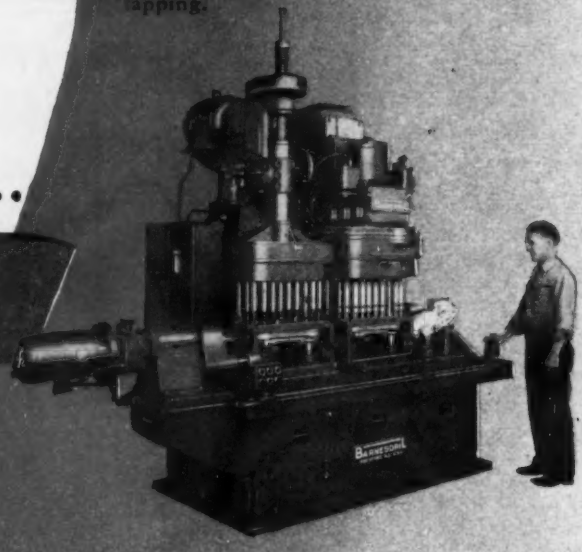
BARNESDRIL engineers can assist you with practical solutions for your special metal working jobs . . . giving you maximum production with reduced costs. There is no obligation for this service.

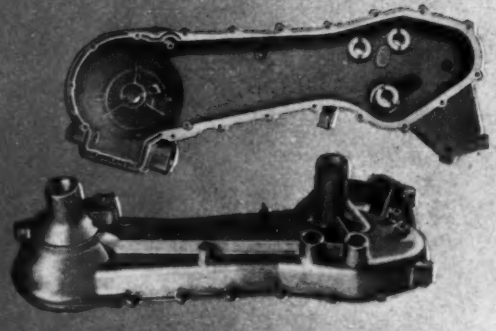
GET THIS BULLETIN

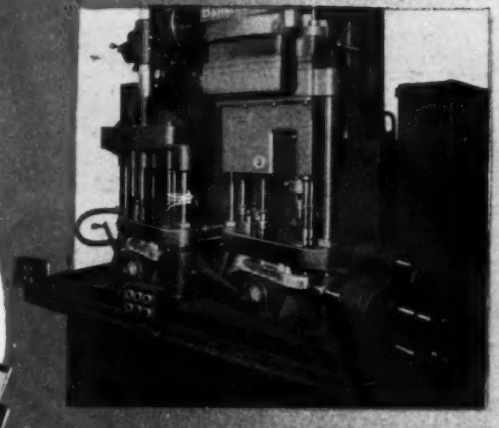


. . . which describes BARNESDRIL Hydraulic Production UNITS and their application to a variety of jobs. Send for Bulletin No. 150-A available without charge.

This BARNESDRIL Production UNIT is equipped with one vertical 23-spindle drilling head; one vertical 23-spindle tapping head; and two horizontal 2-spindle heads, one for drilling and the other for tapping.



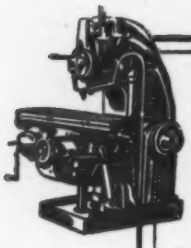




Close-up of spindle arrangement on second BARNESDRIL Production UNIT, equipped with one vertical 8-spindle drilling head; one vertical 8-spindle tapping head; and three horizontal 2, 3 and 4 spindle heads for drilling and tapping.

Barnes Drill Co. 830 CHESTNUT STREET ROCKFORD ILLINOIS, U. S. A.

. . . NOW 25% average



TYPICAL CASE—
MILLING MACHINE

Here is how War Assets Administration's new price has been set for a typical machine; Model 2K Kearney and Trecker Milling Machine, vertical knee action; War Assets Administration S.C. Code 3417-23-20-28.

Price (New).....	$7,054.00
Previous W.A.A. Sales Price (based on depreciation primarily).....	4,091.00
Average Market Value...	2,556.00
New W.A.A. Sales Price.	2,045.00
Available for rebuilding..	511.00

Sales to priority claimants, which include Federal Agencies, Certified Veterans, World War II, and subsequent priority claimants, will be made in proper sequence as required by law.

31 TYPES OF GENERAL PRODUCTION TOOLS REPRICED

- Boring Machine—Horizontal, Precision, Bridge Type, Single and Double End
- Chucking Machine—Automatic, Vertical, Multiple Spindle Type
- Chucking Machine—Single Spindle Automatic, Horizontal Turret Type Machine
- Chucking Machine—Six Spindle Automatic, Horizontal
- Drilling Machine or Drill Press—Bench or Floor, Single or Multiple Spindle
- Gear Cutting Machine for Straight Bevel Gears, (Not Planer Type)
- Gear Hobber—Horizontal
- Gear Hobber—Vertical, Universal
- Gear Shaper—For External Spur Gears Only
- Gear Shaper—For Spur Gears, External or Internal
- Gear Shaper—For Spur and Helical Gears, External and Internal
- Gear Tooth Shaver—For External and Internal Gears (Rotary Type Machine)
- Gear Tooth Grinder—Generating Type, for Spur and Helical Gears
- Gear Tooth Grinder—For Spur Gears, External and Internal (Formed Wheel Type Machine)
- Grinders—Centerless
- Grinder—Crank Pin Grinders
- Grinders—Plain External Cylindrical Grinder
- Grinder—Internal, Cylindrical, Automatic Sizing
- Grinder—Internal Cylindrical (Hydraulic Feed Machine)
- Grinder—Internal Cylindrical, Hydraulic Feed, for Hole and Face Grinding
- Grinder—Surface, Rotary Table Type
- Lathe—Multiple Tool, Not Automatic, Manufacturing Type Production Lathe
- Milling Machine—Automatic and Manufacturing Knee Type
- Milling Machine—Plain Bed Type, Horizontal Spindle Machines
- Milling Machine—Vertical, Knee Type (Not Including Bench Type)
- Polishing and Buffing Machine—Bench and Floor
- Profiling Machine—Vertical, Fixed Bed Type, Single and Multiple Spindle
- Tapping Machine—Vertical, Single or Multiple Spindle
- Thread Grinding Machines
- Thread Milling Machine
- Turret Lathe—Ram Type, Plain and Universal

MACHINE TOOL
SALES DIVISION

BELOWMARKET

NEW "FIXED PRICE" POLICY ESTABLISHED ON 31 TYPES OF SURPLUS MACHINE TOOLS

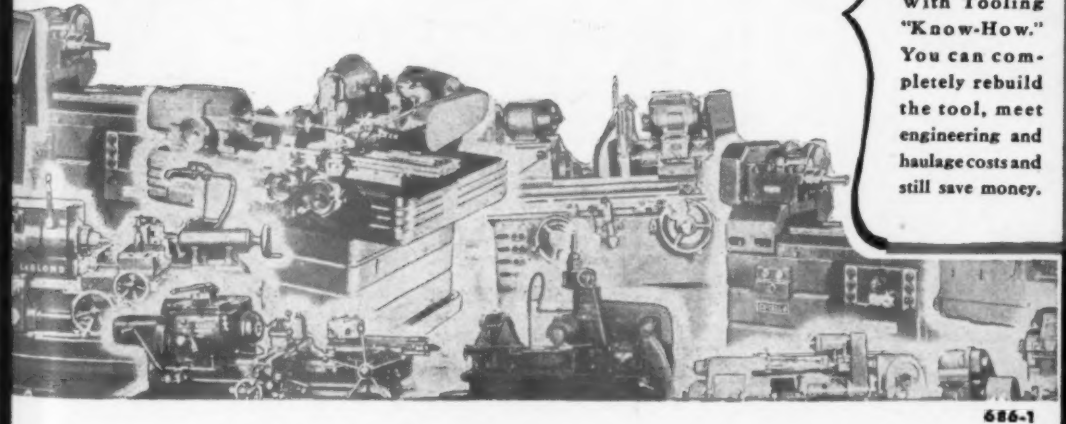
Here is good news indeed for the man who is trying to purchase general purpose production tools for replacement, reconversion or new enterprises. Now you can go into any of War Assets 33 Regional Offices, any machine tool site sale in the United States, or any approved War Assets Administration dealer and buy at the same fixed price, everywhere, the tools in these 31 groups listed at the left. No waiting for complicated figuring of prices, checks against priorities or other delaying factors. The tools are available in such quantity that your purchase can be cleared on the spot, and immediate delivery arranged.

But even more important is the principle under which the new low prices have been set. As the scale at the right indicates each price takes into consideration your costs of rebuilding the tool to new condition, engineering, service, etc. It is set well below the current market price for similar equipment sold on a full service basis. The differential is approximately 25% below market—enough for men with tooling "know-how" to realize a neat "extra" profit and at the same time acquire modern machine tools.

Plan now to check at once the detailed price and specifications list—now available in every War Assets Administration office (machine tool sales division) and the offices of your approved W.A.A. machine tool dealers.

FOR DETAILED PRICE CATALOG— *WRITE, WIRE OR PHONE:*

1. *Your Regular Machine Tool Dealer*
   War Assets Administration has appointed more than 3,000 "approved" dealers throughout the U. S.
2. *W.A.A. Machine Tool Sales Division*
   In any of the 33 War Assets Administration Regional Offices listed below.



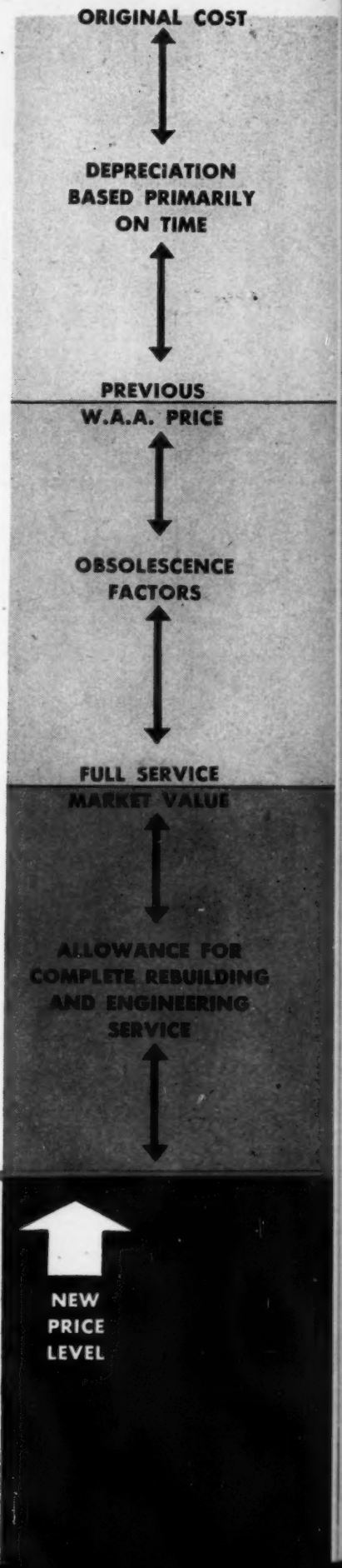
686-1

WAR ASSETS ADMINISTRATION

GOVERNMENT OWNED SURPLUS

Offices located at: Atlanta • Birmingham • Boston • Charlotte • Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit • Fort Worth • Helena • Houston • Jacksonville • Kansas City, Mo. • Little Rock • Los Angeles • Louisville • Minneapolis • Nashville • New Orleans • New York • Omaha • Philadelphia • Portland, Ore. • Richmond • St. Louis • Salt Lake City • San Antonio • San Francisco • Seattle • Spokane • Tulsa

W. A. A.'s NEW PRICING PRINCIPLE


ORIGINAL COST
DEPRECIATION BASED PRIMARILY ON TIME
PREVIOUS W.A.A. PRICE
OBSOLESCENCE FACTORS
FULL SERVICE MARKET VALUE
EXTRA PROFIT AREA
For Alert Buyers With Tooling "Know-How." You can completely rebuild the tool, meet engineering and haulage costs and still save money.
ALLOWANCE FOR COMPLETE REBUILDING AND ENGINEERING SERVICE
NEW PRICE LEVEL

Use the right blade
STAR
MAKES IT!

For the right saw for any given job, see the man who sells STAR Blades! Star makes blades for cutting everything a hack saw or band saw can cut—a *complete* line. Be sure! Tell your Star supplier the job you want to do. He'll tell you—quickly, expertly—what STAR Blade will do it best!

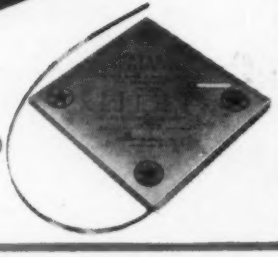
FREE BOOKLET OF HACK SAW HINTS.
Answers blade questions for you as they arise: what speed to use ... coarse teeth or fine ... what causes dulling ... blade lengths ... prices.
Ask your Star supplier for your copy of "Metal Cutting." Helpful ... free.

★ HAND BLADES

★ POWER BLADES

★ FRAMES

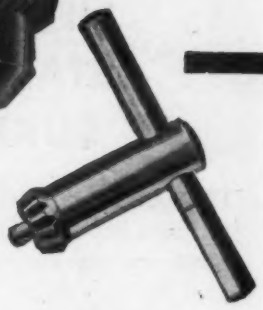
★ BAND SAWS
(including skip-tooth)
(metal and wood cutting)



TRADE MARK

CLEMSON
CLEMSON BROS., Inc., Middletown, N.Y.
Makers of hand and power hack saw blades, frames, metal cutting band saw blades and the Clemson D-17 lawn machine.

Almond Drill Chuck



The Pioneer

Almond Three-Jaw Drill Chucks were Pioneers in their field—the first to be placed on the market. They have formed a necessary part in the logical procedure of machine developments over the past seventy and more years.

Almond Drill Chucks are made in types and sizes *to fit all machine tools and portable drills.*

Write for complete details

T. R. ALMOND MFG. CO.
ASHBURNHAM, MASS., U. S. A.

The Original Manufacturers of Drill Chucks

BURKE MILLING MACHINES

... Put Your Small Work on a Production Basis!

Those small, difficult jobs can be handled on a *production basis* with BURKE Motor Driven Milling Machines Nos. 1, 2, 3, & 4. Primarily, this is because BURKES have been *specially designed and built* to do smaller milling jobs efficiently and economically.

Then, too, a number of attachments are available . . . attachments that increase the units usability, and add to your productivity. These include a vertical milling attachment, index centers, and vises—3 types, including swivel base. Now, when production must be stepped up, is the time to investigate the profit possibilities of BURKE Milling Machines, as applied to your work.

Complete Information Will Be Sent You Upon Request — Write!

BURKE MACHINE TOOL CO.
CONNEAUT · · · OHIO

NATIONAL END MILLS

Choose the Right Tool for the Job

In tooling up for end milling operations, each job must be considered individually to get the best final results. For hard materials or shallow cuts, or if an exacting finish is required, fine tooth End Mills should be used. For softer materials or deep cuts, coarse tooth End Mills will prove more efficient.

End Mills are manufactured in various combinations of spiral and cuts. Each is designed for a definite purpose. Your NATIONAL distributor will help you select the End Mill best adapted to your problem. Consult him on all your metal-cutting needs.

Call Your
DISTRIBUTOR!

Leading distributors in every section of the country have stocks of National Cutting Tools. Every National distributor offers factory-trained engineers to serve you. Call your National distributor for cutting tools or any staple industrial product.

NATIONAL

NATIONAL TWIST DRILL & TOOL ROCHESTER, MICH., U.S.A.

TWIST DRILLS
REAMERS. HOBS
MILLING CUTTERS
COUNTERBORES
SPECIAL TOOLS
END MILLS

TWIST DRILL AND TOOL COMPANY

ROCHESTER, MICH., U.S.A.

Tap and Die Division — Winter Bros. Co.

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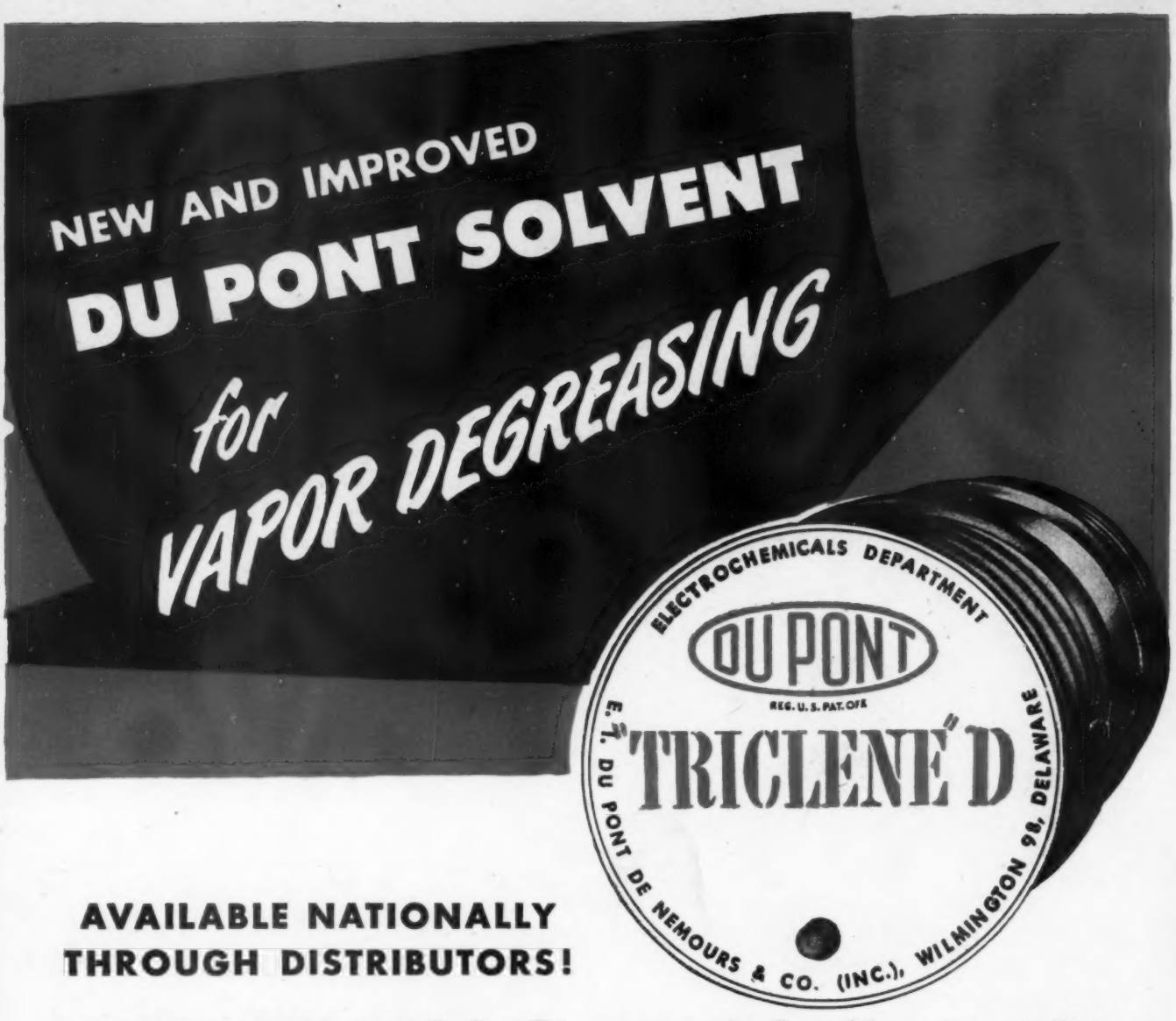

AVAILABLE NATIONALLY THROUGH DISTRIBUTORS!

UNDER VARIOUS TRADE NAMES, Du Pont Trichlorethylene and Perchlorethylene solvents for metal cleaning have served American industry successfully for many years. If you have used vapor degreasing solvents in your plant, no doubt you have used these solvents made by Du Pont.

NOW Du Pont has developed *new and improved* Trichlorethylene and Perchlorethylene — the same fine solvents, but BETTER THAN EVER, thanks to various technical improvements. These are the best Vapor Degreasing solvents we've ever made—the best we know how to make. Use them with complete confidence and assurance for all metal degreasing work. We believe they'll serve you *better!*

NEXT TIME you specify solvents for Vapor Degreasing, specify *new and improved* Du Pont Trichlorethylene and Perchlorethylene—available nationally through distributors as "Triclene" D and "Perclene" and under other trade names. Look to these solvents for superior work, maximum savings! Send today for your copy of our new free book, "Metal Degreasing— Standard Practices."

E. I. du Pont de Nemours & Co. (Inc.)
Electrochemicals Department
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BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

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DU PONT SOLVENTS

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prepared by electrical, chemical and mechanical engineers who have the ability to investigate and write... who together with draftsmen and artists explain and visualize your product.

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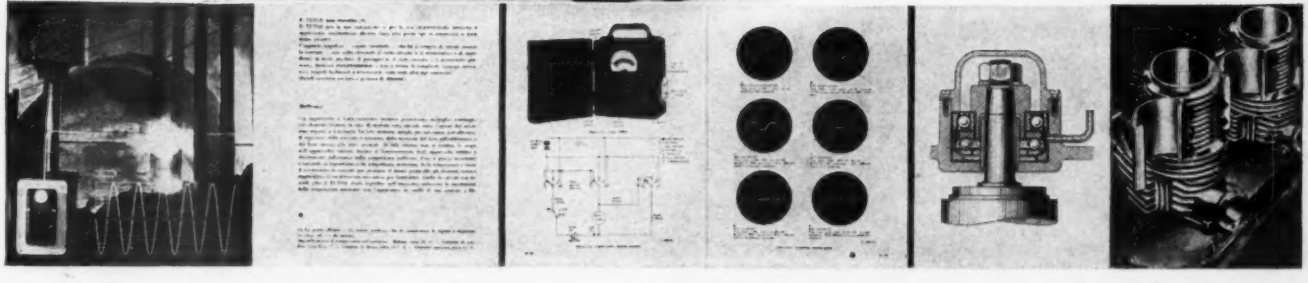

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TECHLIT CONSULTANTS, INC.
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ACE DRILL CORPORATION · DETROIT 27, MICHIGAN

POLISHED FLUTES

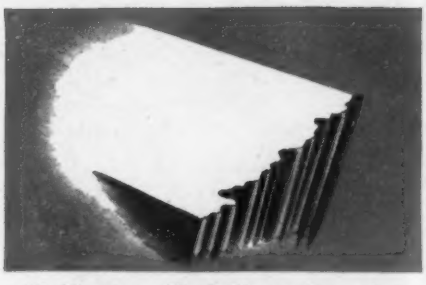
- IMPROVE CUTTING EDGES
- FACILITATE CHIP FLOW
- INCREASE PRODUCTION
- REDUCE COSTS

The polished flutes of all Ace Drills are ground into pre-hardened bars of high speed steel.

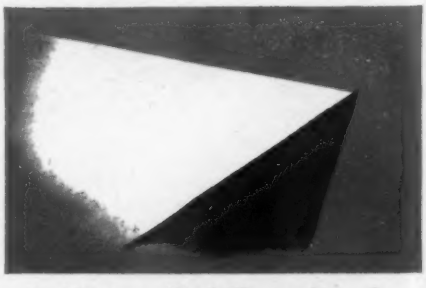
This smooth, polished surface is like a honed razor. The cutting edges, formed by the intersection of two ground surfaces are even and smooth. Cutting edges formed by the intersection of a ground surface and a milled surface are rough and irregular by comparison.

High sharp points and low dull points are characteristic of coarser finishing processes. When the drill flutes are ground and polished there are no high sharp points which will break off and leave only a low, irregular line of dull points which cannot cut cleanly. The edges stay keen longer reducing "down time" on machines using Ace polished flute drills.

Polished flutes mean smoother, more adequate chip flow. This means that deeper holes can be drilled with less chip interference.



Highly magnified illustration of a cutting edge which has been formed by the intersecting of a milled surface and a ground surface.



Highly magnified illustration of a cutting edge which has been formed by the intersecting of two ground surfaces.

2254

ACE DRILL CORPORATION

MANUFACTURERS OF "GROUND FROM THE SOLID" DRILLS AND REAMERS

13835 JENNINGS ST., • DETROIT 27, MICHIGAN

GROUND FROM THE SOLID

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MINING INDUSTRY | MUNICIPALITIES | NEWSPAPERS
GEAR WORKS | GOVERNMENTS | IRON WORKS
DIE COMPANIES | DRYDOCKS | ELECTRICAL COMPANIES
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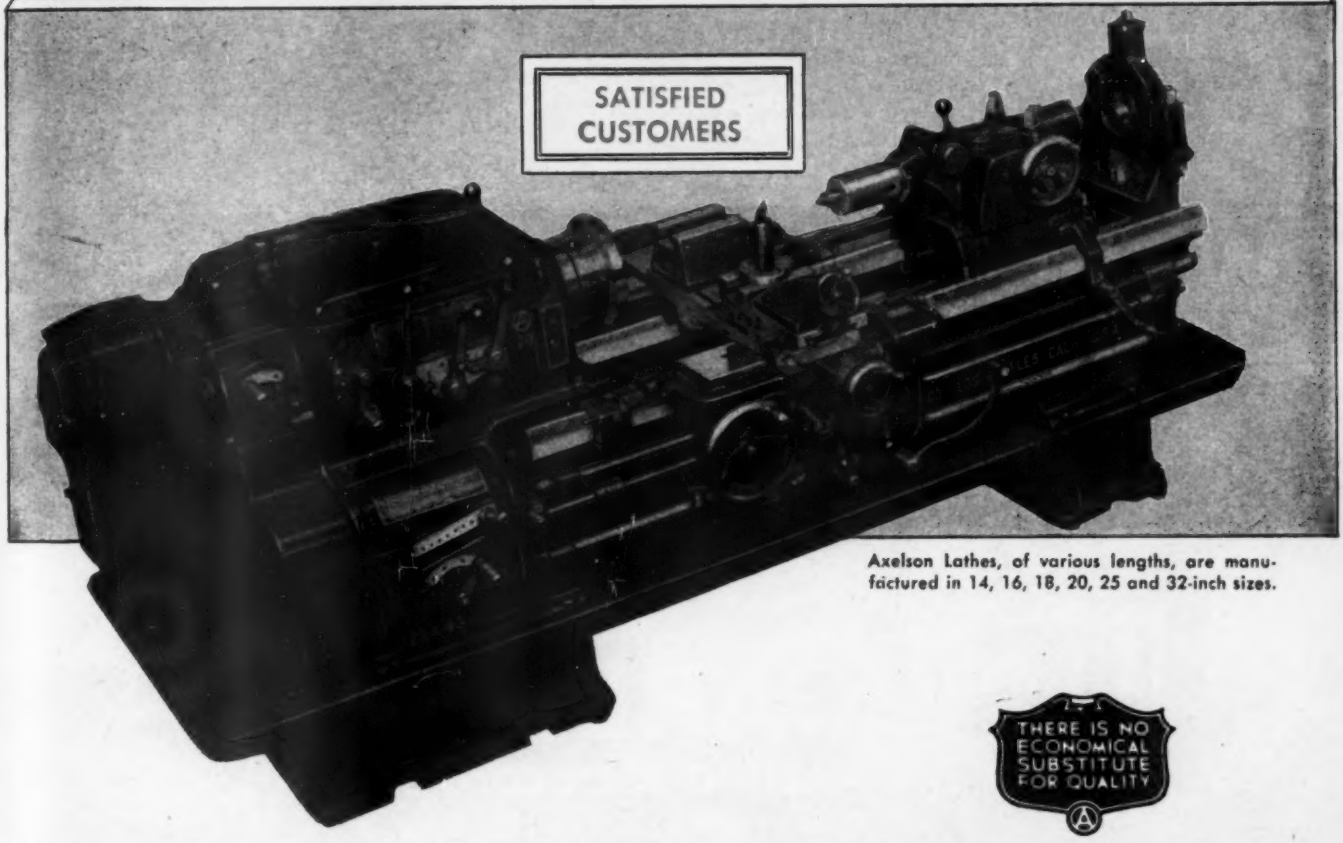


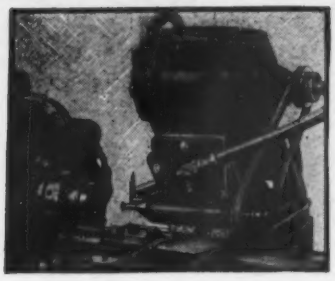
Axelson Lathes, of various lengths, are manufactured in 14, 16, 18, 20, 25 and 32-inch sizes.

THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

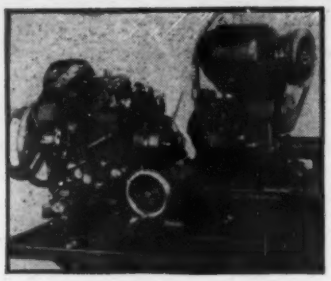
Axelson Lathes are a blue-ribbon machine tool recognized and used by the major industries of the United States and by Governments and by leading metal turners all over the world . . . The list of Axelson customers puts on display a parade of great names in light and heavy industry everywhere. The reason for this is simple. The Axelson heavy duty Lathe is exceptional for it reflects thirty years of determination to achieve quality that will stand out in precision, performance and per-piece economy in operation. A great Lathe ready to serve superbly in the bright industrial future.

AXELSON MANUFACTURING CO.
6160 S. Boyle Ave. (Box 98, Vernon Station), Los Angeles 11, Calif.
50 Church St., New York City 7 • 3844 Walsh St., St. Louis, Mo.

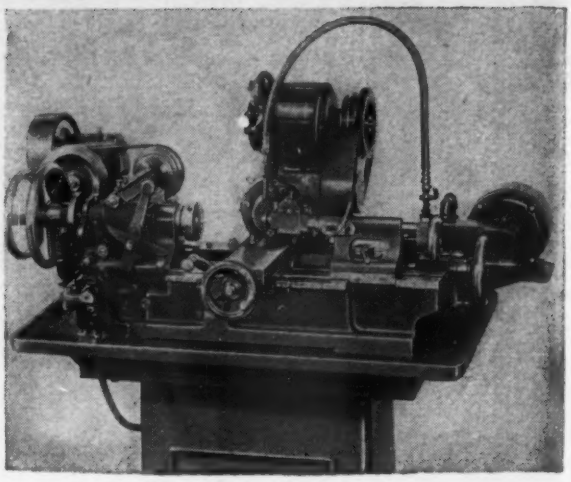
AXELSON LATHES
Dependable for over a Quarter Century



Machine equipped with Internal Milling Attachment



Machine equipped with Relieving Head



ALL STANDARD FORMS OF THREADS CAN BE PRODUCED TO CLOSEST TOLERANCES ON

WALTHAM THREAD MILLERS

Three motors on these machines provide a wide flexibility in operation as well as a constant supply of coolant for all requirements. By simply changing ratios, speeds are suitable for cutting either brass or steel. Waltham can furnish cutters for any thread form desired.

Machines are mounted on cabinet base with two shelves inside. Standard equipment includes: three motors with push button start and automatic or push button stop—follow rest—one milling cutter—indexing device for cutting multiple threads—5 pitch lead screw—change gears for cutting from 5 to 40 threads per inch.

Special Equipment Extends Utility

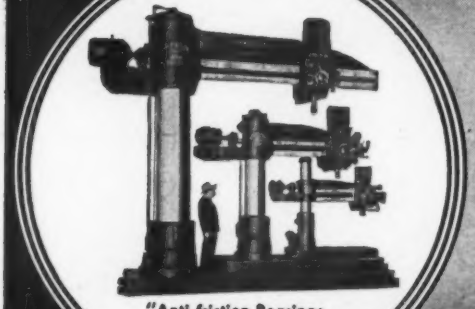
Extra equipment includes: a special work head for relieving—a special motor driven cutter head for internal threading—a multiple cutter threading attachment—automatic cam operation—special tailstock for multiple cutter work—translating gears for cutting metric threads—metric lead screw—plain taper attachment.

Write for Bulletin 244A giving detailed information.

WALTHAM MACHINE WORKS

WALTHAM, MASS.

WALTHAM TRADE MARK REGISTERED U.S. PAT. OFF.



"Anti-friction Bearings Throughout"

CARLTON RADIAL DRILL

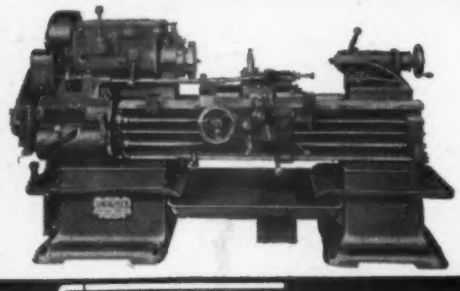
FEATURES— 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The CARLTON MACHINE TOOL COMPANY

CINCINNATI, OHIO, U. S. A.

ARMY E NAVY

SPRINGFIELD GEARED HEAD LATHES



. . . versatile, efficient!

Springfield designs lathes to retain accuracy and speed over long periods of use. For quantity production or special use they're economical and extremely adaptable. Sizes available range from 14" to 30". *Write for descriptive bulletins, prices and deliveries.*

The SPRINGFIELD MACHINE TOOL COMPANY • • • SPRINGFIELD, OHIO, U.S.A.

AMAZING NEW MILLING EFFICIENCY!....

WITH SUPER SOLID CARBIDE INSERTED BLADE MILLING CUTTER

CUTTER

FACE MILLING — HALF-SIDE MILLING

- LONG LIFE
- HEAVY CUTS
- VERSATILE

BACK VIEW OF CUTTER

Specify SUPER Solid Carbide Inserted Blade Milling Cutters for extra machining efficiency and low tool cost. You get the outstanding economy of virgin Tungsten Carbide in these versatile cutters that machine *any* material.

Rugged SUPER design assures long tool life. Blades absorb shocks, and clamp screws are threaded into the steel wedge—not the body, eliminating possibility of damage to the body.

Non-slip wedges permit easy adjustment of blades for wear. The mechanically-held blade has an unusually long grind life—it is rugged and resistant to cracking and chipping. Blades are of large size proven more economical in tests.

Standard 6", 8", 10" and 12" cutters can be delivered quickly. Check for applications of this SUPER Solid Carbide Inserted Blade Milling Cutter at once! See our local representative or contact us direct.

GRINDING FIXTURES AVAILABLE FOR CAST IRON AND STEEL TYPE BLADES

SUPER TOOL COMPANY

Carbide Tipped Tools

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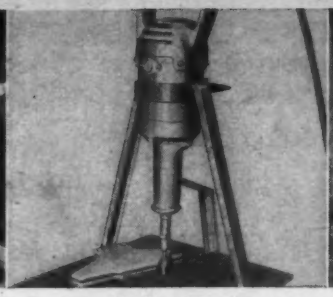
DUMORE
No. 9 HG
¼ HP — 15,500 RPM
¼" capacity chuck

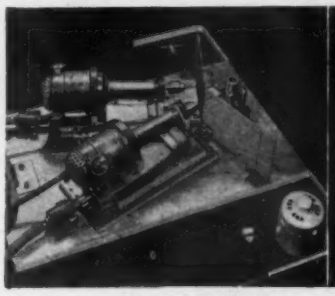
Cleaning Welded Joints



Contour Milling Hard Copper

Spark-Testing Steel

DUMORE
No. 10 HG
1/10 HP—22,000 RPM
⅛" capacity chuck

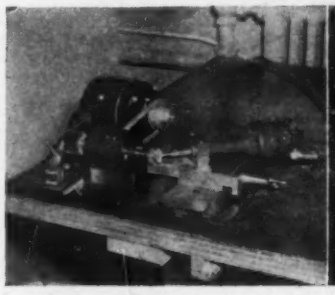


Automatic Drill Head

Touching-Up a Forging Die

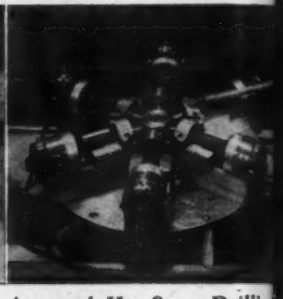
De-Burring Gear Teeth

DUMORE
No. 8 HG
1/20 HP—18,000 RPM
⅛" capacity chuck



Automatic De-Burring Unit

Finishing Plastic Mold



Automatic Hex-Screw Drilling

YOU can do an endless variety of jobs with a sturdy, serviceable Dumore Handgrinder

Its rugged durability guarantees efficient, trouble-free service

When you have a job that requires a good handgrinder, select a Dumore. Grinding is only the first of many jobs you can do with these versatile tools. They have scores of other applications (a few illustrated on this page) — polishing, finishing, sanding, burring, scoring, touching up, drilling, milling, and many more.

Dumore Handgrinders are more than just hand tools. Many ingenious users have built special machines in which the work heads are one or more Dumore Handgrinders. Such machines are reliable, low-cost production units requiring minimum maintenance attention.

Dumore Handgrinders are sturdy tools — designed to give long and dependable service — built to stand under the constant strain of heavy production schedules.

You can find many spots in your plant where service difficulties can be eliminated, production simplified and speeded up, by using Dumore Handgrinders. Ask your nearby distributor to recommend the right size for your needs. Write for complete information. The Dumore Company, Racine, Wisconsin.

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If your plant is located in the Midwest there is one of these cutting oil specialists at the nearest Standard Oil office ready to study your cutting oil needs. There are two sound reasons why he can help you. First, he has complete knowledge of products developed by Standard Oil for practically all machine operations. Second, he has experience in applying these products in many other plants.

You'll find Standard's Cutting Oil Service the real short cut to your cutting oil needs. Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

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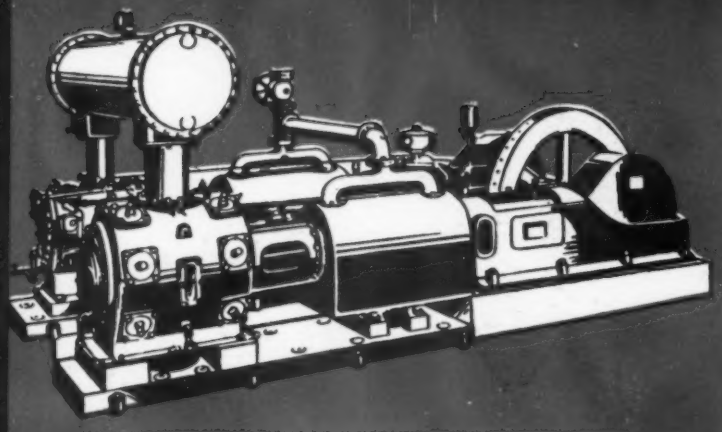
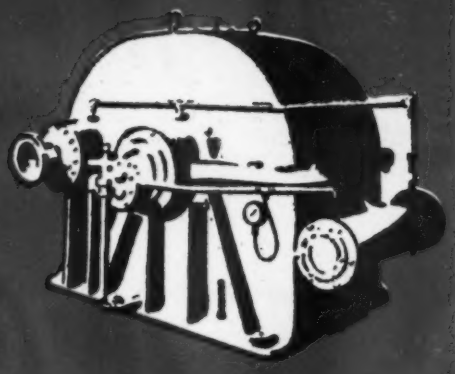
CUTTING OIL SERVICE

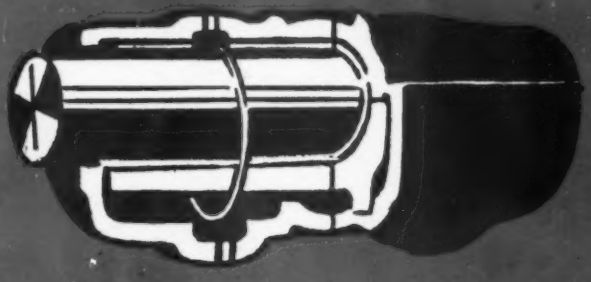
STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE



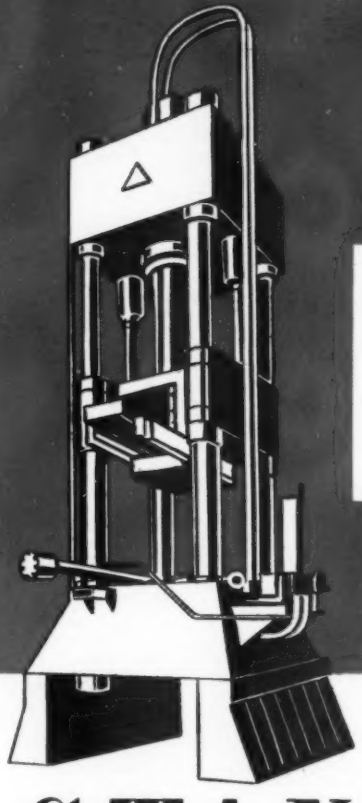
Less deposits in compressors because the improved oxidation stability of Stanoil resists heat . . . the low carbon forming base oil in Stanoil helps keep valves free from carbon.



Fewer oil changes in gear cases because the inhibitor in Stanoil prevents excessive acidity and deposit formation over long periods of operation.



Low bearing wear because of Stanoil's high lubricating quality and because its high viscosity index assures a free flow of the lubricant at starting, and resistance to thinning out as temperatures increase during operation.



Reliable hydraulic system operation because Stanoil contains an anti-foaming additive which prevents erratic operation caused by air entrained in the oil.

You get all these advantages in one oil . . . STANOIL

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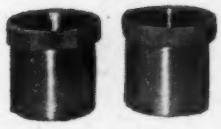
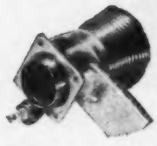
PARTS LIKE *these*

Universal bearing honed to 10 micro inch finish gives longer service.



Line reamer bushings, diameter 2.375", accuracy held to .0001".

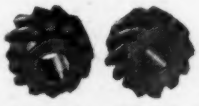


Miniature aircraft cylinder—smooth, accurate honing provides better compression and longer life.

Saved time in producing a smooth accurate finish on this bronze remote control valve body.

Aircraft Hydraulic Brake Cylinder. Produced a straighter hole in one-third the time required for lapping.

Hydraulic Two-Way Control Valve. Hole is honed to eliminate leakage.



Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.

Diesel Engine Fuel Injector Cylinder. "So accurate that a piston can be fitted within .00005"."

Roller Bearing Outer Race. Finish improved from 12 micro inches to 2 micro inches.

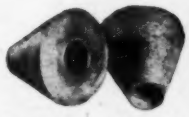
Inner Bearing Ring. "Accurately removes last 'tenth' of stock."

Aircraft Valve Guide. Valve tappet roller pin hole honed to 6 micro inch finish.

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit.

Aircraft Piston Pin. Sunnen honing removes all tool marks—eliminating a source of stress failure.



Cones for Wheel Balancing Machine. "Accurately align-hones two interrupted surfaces."

are Honed More Accurately on the Sunnen Precision Honing Machine

Guaranteed Accuracy — The Sunnen Precision Honing Machine is guaranteed to produce accurate holes within .0001" — and on some hardened steel jobs accuracy has been held to .000025". Holes are straight and round — free from bell-mouth and taper.

Range .125" to 2.625" — Hones and finishes parts up to 18" in length in the larger diameters. Hones 2 or more interrupted holes in alignment. Handles blind hole as well as open end work.

Hones Any Metal *(including Nitrided Steels and Sintered Carbides)* ***or Plastic,*** except lead and babbitt, including glass and ceramics.

Smooth Finish — Sunnen Precision Honing Machine produces any desired commercial finish. Depending on the material, a finish of 2 to 3 micro inches can be obtained.

In addition to these advantages the Sunnen Precision Honing Machine can be easily and quickly set up — usually takes about one minute to change from one job to another. No jigs or fixtures are needed — skilled labor is not required — economical to operate.

Write for descriptive literature, giving complete details — or ask that a Sunnen engineer show you how you can use Sunnen honing in your plant.

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meet every demand for precision truing of grinding wheels

Diamond Boring, Turning and Facing Tools; Diamonds for Hardness-Testing; Diamond Gage Contacts; Diamond Styli; Diamond Abrasive and Engraving Tools.

Whether for machine or hand truing . . . whether for use in grinding taps, threads, broaches, gages, contour forms . . . in fact for every service where grinding wheels are trued, there is a Gilmore Diamond Tool specially developed for the purpose. Thus by coming to Gilmore for solution of your wheel truing problems you can be assured of a complete, specialized service and take advantage of our long experience as pioneers in the development of modern methods for precision truing of grinding wheels.

Gilmore offers every modern facility for diamond selection, diamond cutting and tool making. Mountings are the result of constant research in laboratory and field. Diamonds are set not only to assure maximum security but also to provide longest-lived cutting edges. Furthermore, Gilmore is prepared to meet your specifications for special diamond tools.

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Send at once for a copy of the new 32-page Gilmore Catalog #45 on Diamond Tools. It will help you solve your wheel truing problems.

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No. 1½	HAND FEED SURFACE GRINDER	**No. 3B**	AUTOMATIC FEED SURFACE GRINDER

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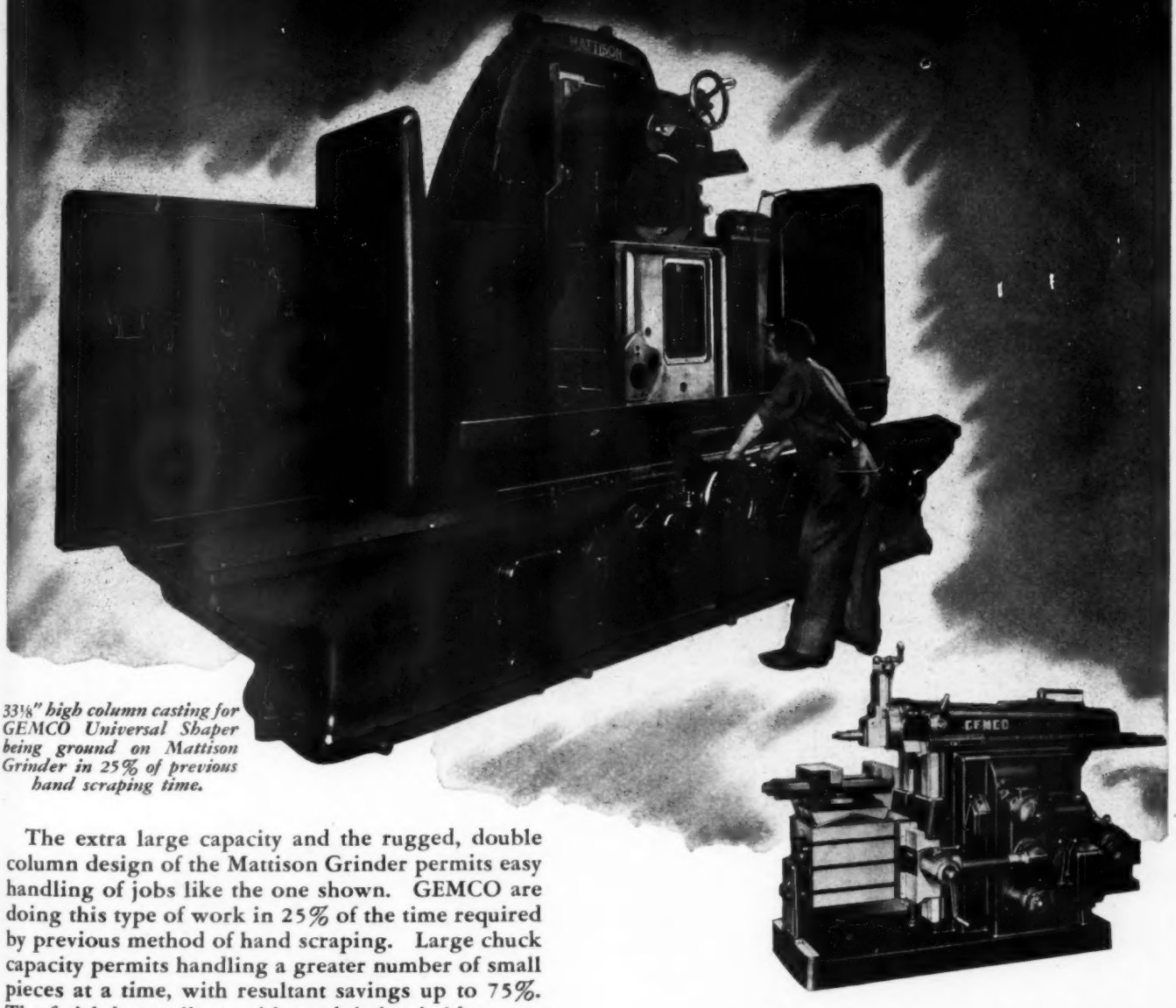
PRECISION GROUND on MATTISON GRINDER in 1/4th the TIME OF PREVIOUS SCRAPING METHOD



33⅛" high column casting for GEMCO Universal Shaper being ground on Mattison Grinder in 25% of previous hand scraping time.

The Mattison Grinder job illustrated is a Column casting for a 24" GEMCO Universal Shaper.

The extra large capacity and the rugged, double column design of the Mattison Grinder permits easy handling of jobs like the one shown. GEMCO are doing this type of work in 25% of the time required by previous method of hand scraping. Large chuck capacity permits handling a greater number of small pieces at a time, with resultant savings up to 75%. The finish is excellent, with work being held to very close limits.

Parts ground include ram ways and vertical guides of the column, the ram, ram gibs, the tool head body, tool head slide and clapper box, the crossrail, all table surfaces and table support rail, the vise base, vise body and hardened jaws, crank block and crank plate.

The policy of grinding whenever possible pays off in lower costs, increased production and higher output.

Write for free Set-Up Book containing further examples showing how others have reduced time and cut costs with Mattison Grinders.

MATTISON MACHINE WORKS

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POINTS to PRODUCTION

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Excessive drill costs and imperfect holes, in most cases, can be traced to improper grinding of the drill points.

Machine grinding has proven a more accurate method of sharpening drills. Properly machine ground, a drill will cut faster, produce more accurate holes and last longer than if ground by hand.

The Oliver 510 Drill Pointer will grind all drills from 1/4" to 3" with the proper variable point angle and variable clearance. It is entirely automatic in operation.

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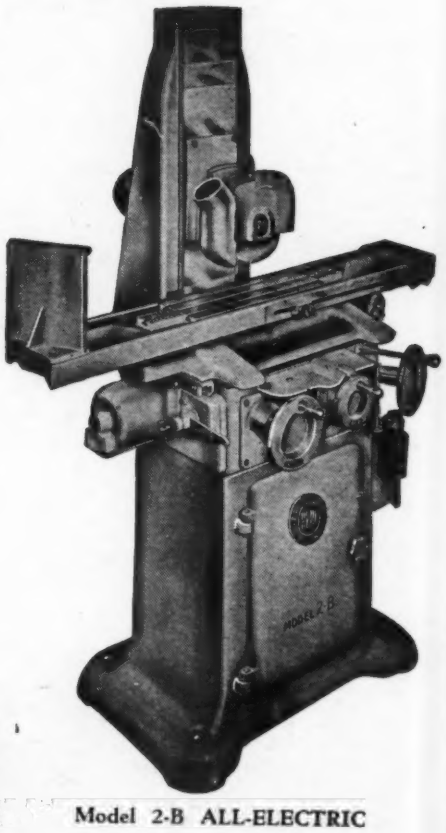

Model 2-B ALL-ELECTRIC

REID BROTHERS COMPANY, INC.
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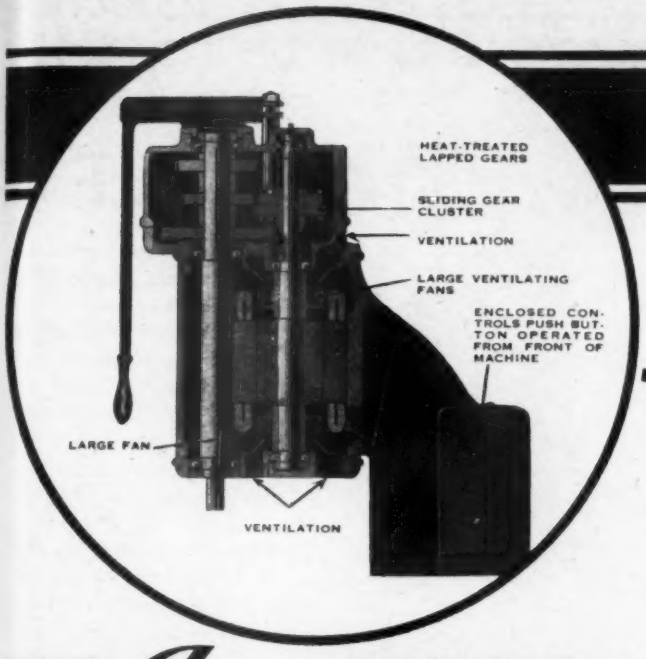


THE Avey TYPE MA-6

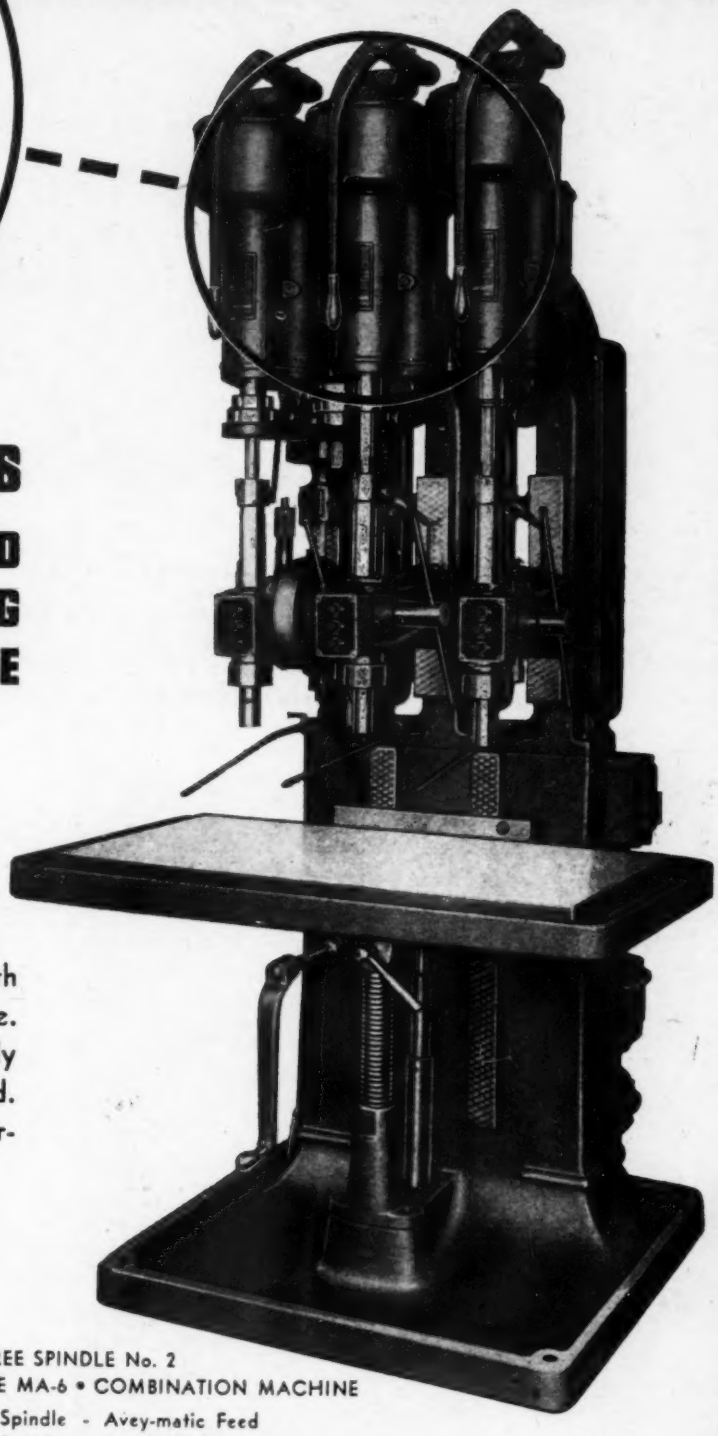
AVEY-MATIC POWER FED HAND FEED AND REVERSING MOTOR TAPPING MACHINE

features

motor and gear box construction of six speed machine

Motor mounted directly back of spindle with gearing between motor and spindle drive sleeve. Two speed motor, three speed transmission. Only one pair of gears in mesh at any spindle speed. Motor and spindle drive mounted on ball bearings, fan ventilated motor.

Type MA-6 is made in following capacities:
No. 2 — 7/8" capacity in cast iron.
No. 3 — 1 1/4" capacity in cast iron.



THREE SPINDLE No. 2
TYPE MA-6 • COMBINATION MACHINE
1st Spindle - Avey-matic Feed
2nd Spindle - Hand Feed
3rd Spindle - Tapping (Reversing Motor)

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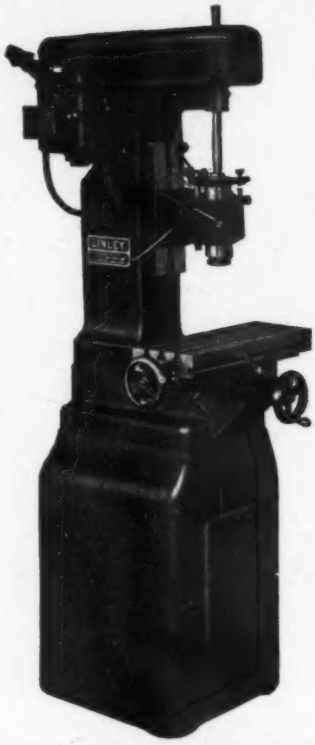

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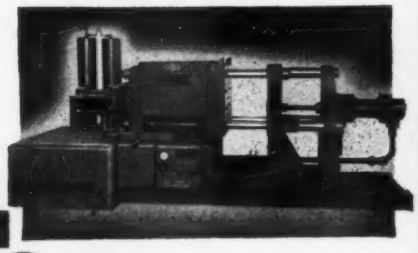

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INTERRUPTED THREAD PIPE TAP

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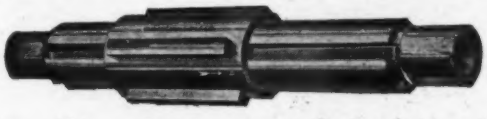
NICHOLSON EXPANDING MANDRELS



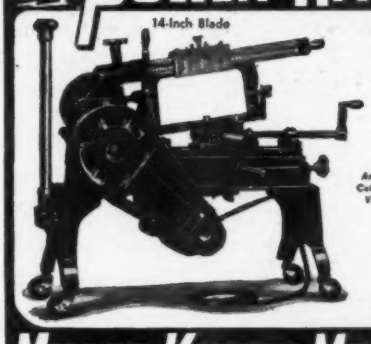
These widely used tools cut costs for you 2 ways: by saving the time lost in making or looking for solid arbors; by promoting precision. Set of 19 Nicholson expanding mandrels does the work of 209 solid arbors.

Bulletin 1043

Other Products: Steam Traps, Control Valves, Arbor Presses, etc.

W. H. NICHOLSON & CO., 114 Oregon St., Wilkes-Barre, Pa.

POWER HACK SAW ★



LOW PRICED
SELF-CONTAINED
PORTABLE
STURDY
READY TO WORK
ECONOMICAL

EXPORT DEPT.
1111 SO. FERRY BLD'G.
NEW YORK 4, N.Y.

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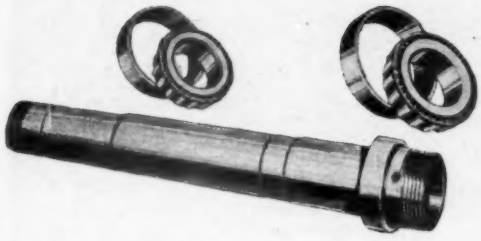
MILLER-KNUTH MFG. CO. OMAHA, NEB.

3 announcements in 1



The New TRB-S56

SHELDON precision lathe

New an 11" lathe with "Zero Precision" Tapered Roller Spindle Bearings.

New a moderate priced lathe with precision unsurpassed in any price class.

New the well known "S56" now combining 11¼" swing, 1" collet capacity and zero precision tapered roller bearings.

SPECIFICATIONS

Headstock Bearings—Tapered Roller Bearings Zero Precision
Collet Capacity—1 inch (round)
Hole Through Spindle—1⅜ inch
Swing—11¼ inches
Bed Length—56 inches
Distance Between Centers—35 inches
Spindle Drive—Double V-Belt
Spindle Speeds—8 speeds
Full Quick Change Gears—48 right and left changes 2 to 224 threads per inch
Full Double Walled Apron—Worm driven longitudinal and cross feeds
Dovetail Taper Gibs—Compound Rest and Cross Slide have screw adjusted tapered gibs to take up wear.
Underneath Motor Drive—4-Speed, V-Belt fully enclosed in bench pedestal.
Steel Bench—Heavy Top, Braced Welded steel construction, 5 drawers.

Write for TRB-S56 circular

SHELDON MACHINE CO., Inc.

4234 N. Knox Avenue Chicago 41, U. S. A.

OUT OUR WAY

DID YOU SEE THAT BIRD JUMP WHEN THAT BELL RANG? HA-HA! IT MUST HAVE WOKE HIM UP! I WONDER IF THEY WASN'T PUT ON THERE FOR THAT!
THEY PROBABLY WAS, BUT THEY DON'T NEED 'EM THESE DAYS, WITH ALL TH' SAFETY MACHINES THAT YOU CAN'T GET CAUGHT IN!
YES, THEY EVEN PUT SOL-SPEEDI-DRI ON THE FLOOR NOW-- A SLEEP-WALKER WOULD EVEN BE SAFE FROM FALLING WITH THAT STUFF ON TH' FLOORS!
J.R.WILLIAMS
SAFETY FIRST THAT LASTS
T. M. REG. U. S. PAT. OFF. COPR. 1946 BY NEA SERVICE, INC.

Sol-Speedi-Dri Makes Floors Safe for Walking . . . Safe for Working

Another name for "Safety" is SOL-SPEEDI-DRI . . . the white, granular absorbent. SOL-SPEEDI-DRI takes the slips and falls out of oil-soaked floors . . . soaks up soluble oils, resins, syrups, solvents, acids, coolants, and regular oils and greases as a blotter soaks up ink.

There's no danger of fast-spreading flash-fires with SOL-SPEEDI-DRI on the floors. This hard-working, oil-thirsty absorbent won't burn, even when completely oil-soaked. No complicated machinery . . . no trained personnel . . . is required to use SOL-SPEEDI-DRI. It works . . . while you work in safety!

SUPPLIERS:—*East:* Safety and Maintenance Co., Inc., New York 1, N. Y.
South, Midwest, and West: Waverly Petroleum Products Co., Philadelphia 6, Pa.

SOL·SPEEDI·DRI
OIL AND GREASE ABSORBENT
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FREE SAMPLE
Get the full story of SOL-SPEEDI-DRI today. Just write "SOL-SPEEDI-DRI" across your letterhead or business card and mail.

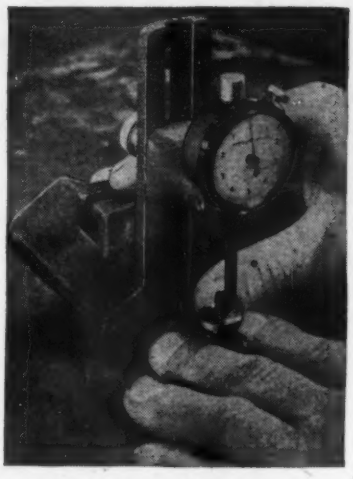
TU-MY-CO

TRADE TUMICO MARK

PEDESTAL INDICATORS, MICROMETERS

Handy, Accurate, Practical Measuring Instruments

Save time and improve workmanship on a wide variety of layout, machining and inspection operations. Step up production, reduce errors.



MODEL "AD" PEDESTAL INDICATOR shown in use as a fast, handy, adjustable inspection gage. On machine set-ups it can be clamped to a spindle for quickly lining up the work. Adjustable height range to 3 inches. The swiveling indicator permits the point to be presented in any direction. Other models to fit a wide range of needs.

TU-MI-CO PEDESTAL MICROMETERS with micrometer instead of dial indicator—for setting boring bars and other uses. The base of pedestal has both flat and vee faces for use on plane or cylindrical surfaces.

Precision is a TU-MI-CO tradition

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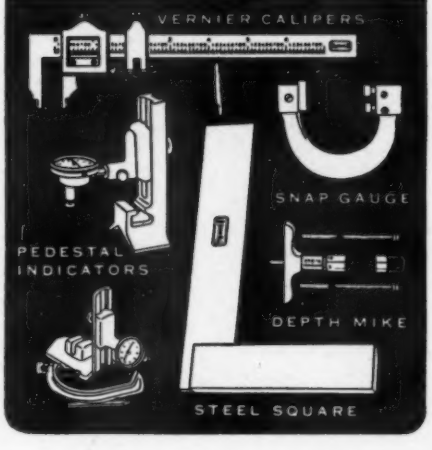
TUBULAR MICROMETER CO.
ST. JAMES, MINNESOTA, U. S. A.
Milwaukee Branch • Plankinton Bldg.



USE SCULLY-JONES

Style "B"

DRILL CHUCKS

See page 44, Scully-Jones Catalog No. 500 for Style "B" Drill Chucks.

...and save the difference between the cost of straight and taper-shank drills.

It's as much as 25% on drills ½ inch and under.

Scully-Jones Style "B" Drill Chucks are tough—take a lot of punishment and outlast many drills.

Stock Delivery

Write for complete information on prices and sizes—today.

Refer to the Scully-Jones Catalog showing over 500 types and sizes of cutting tools, collet chucks, boring equipment, centers, etc.

1980

Scully-Jones AND COMPANY

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Specify "Republic"

Inspectors and Production men whose first consideration is value, invariably pick REPUBLIC GAGE as their source for gages.

For years REPUBLIC has enjoyed top rating as manufacturers of thread gages with "THAT UNSEEN EXTRA QUALITY." May we serve you?

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REPUBLIC GAGE

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SECOMET

DIAMOND WHEELS

The full line of JKS Sécomet diamond wheels consists of resinoid, metal and vitrified bonded types. In order to produce perfect finishes on carbide tipped tools and other required metal surfaces, diamond powder is evenly graded by a unique JKS scientific process and uniformly distributed throughout the bonds. Select your wheels from Price List No. 45.

J. K. SMIT & SONS, Inc.

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NATIONAL KEYSEATING MILLER

. . . the tool that converts drilling machines into key-seaters and saves time and money

• With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

The National Keyseating Miller mills, keyseats in one cut. It can be used on offset holes and blind holes. Work clamping is unnecessary. We also manufacture oil-grooving millers.

Made in twenty-seven different diameters from ½" to 3½". Several widths of cutters can be used in each size.

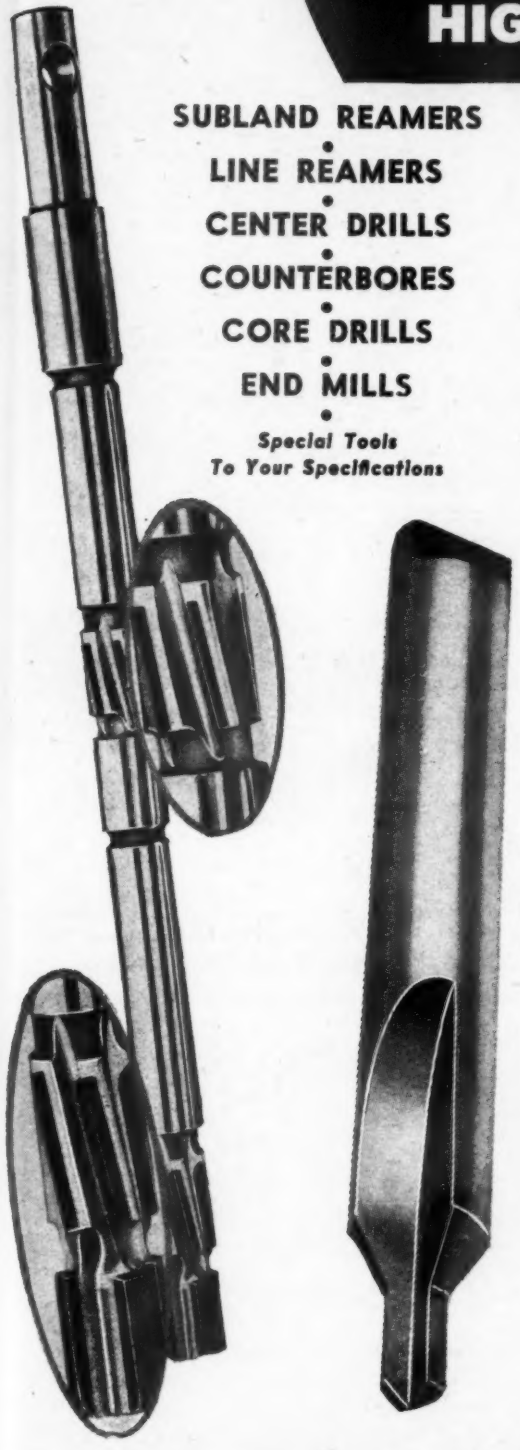
WRITE TODAY FOR OUR NEW CATALOG NO. 16

NATIONAL MACHINE TOOL CO.

CINCINNATI, OHIO

Now!

CARBIDE-TIPPED TOOLS
BRAZED ON HARDENED
HIGH-SPEED STEEL BODIES



SUBLAND REAMERS
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LINE REAMERS
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CENTER DRILLS
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COUNTERBORES
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CORE DRILLS
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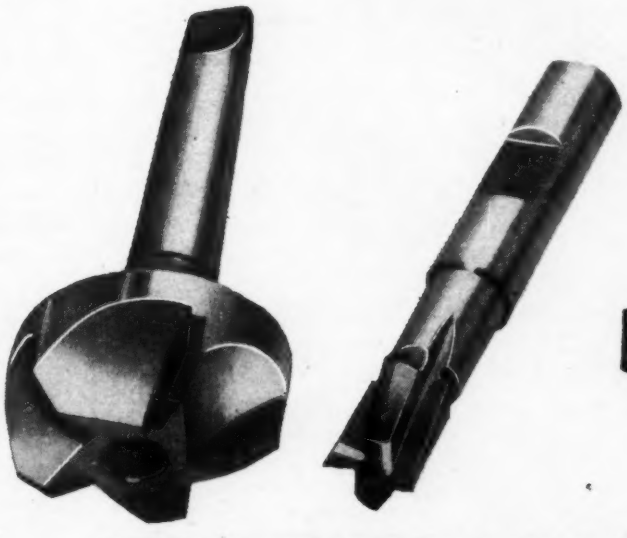
Special Tools To Your Specifications

AGAIN, Detroit Reamer & Tool Company sets the pace in metal cutting tools, with brazed carbide tips on hardened high-speed steel bodies, so that the total length of flutes and pilots will Rockwell C-62-63.

It has also been proved in actual practice that this type of tool has a higher cutting efficiency due to the harder background for the carbide tips which produces less "spring-back" under heavy cuts for this same reason. Also, the flutes and pilots will not "score" or pick up due to the hardness of the high-speed steel and long wear on the pilot.

All of these outstanding advantages, together with longer tool life and reduced production costs, are at your disposal with Carbide Tipped Cutting Tools, with HIGH-SPEED STEEL BODIES.

• ***MADE TO YOUR SPECIFICATIONS*** •



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DETROIT REAMER & TOOL CO.
2830 E. 7-MILE ROAD DETROIT 12, MICHIGAN
Manufacturers of Oil-Hole Drills, Subland Drills, Special Reamers, Circularity Relieved Reamers, End Mills and Special Tools.

SWEDISH LIDKÖPING CENTERLESS GRINDERS

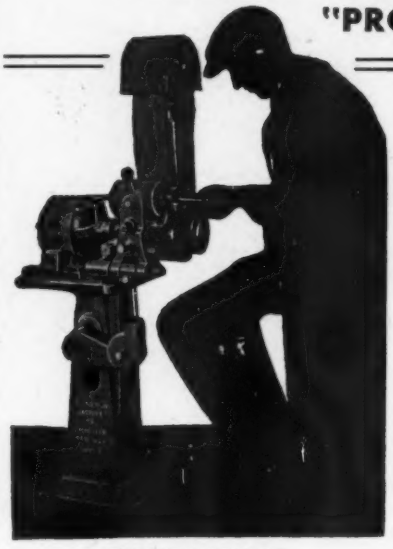
Built, since 1922, by Sweden's oldest and largest machine tool factory. Most powerful.

For detailed catalog write to

TRIPLEX MACHINE CORP.

125 Barclay St. New York 7, N. Y.

***. . . for high speed, fine uniform finish use the* TYPE "S" "PRODUCTION"**



The Type "S" Production Centerless Grinder combines a centerless feed polishing machine with a vertical or horizontal surfacer, polisher or buffer. It will handle cylindrical work ¼ to 1" diameter automatically when equipped with Centerless Feed Attachment.

This machine also provides the means for handling straight line finishing of flat work by hand manipulation, and assures fine work even with inexperienced operators. Any material that can be ground or polished can be finished on the Type "S".

SPECIFICATIONS

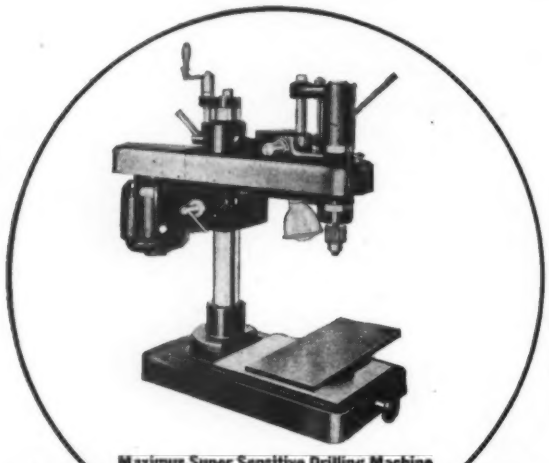
Abrasive Belt . . . 4" wide, 60" long
Belt Speed . . . 3200' per min.
Table . . . 4½"x13½"
Dist. Table to Floor . . . 36"
Motor . . . 1 H.P., 1750 rpm.
Ball Bearing equipped

Write for illustrated literature giving full details

PRODUCTION MACHINE CO.

Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.

GREENFIELD, MASS., U. S. A.



Maximus Super Sensitive Drilling Machine

TO DRILL HOLES THAT ARE

TINY *and* ACCURATE

Instrument makers, and others requiring equipment for tiny hole, precision drilling on a production basis, are increasingly turning to the Maximus, Super Sensitive Drilling Machine as the ideal tool. **Sensitive and versatile,** with ample clearances, spindle speeds and safety factors, this sturdy, precision built machine drills holes from .004" to $\frac{7}{16}$" diameter with unique accuracy and on a high production schedule. Write for literature, specifications and price list. Address Department D-M.

THE *Hamilton* TOOL COMPANY

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STANDARD US HEADS SINCE 1915

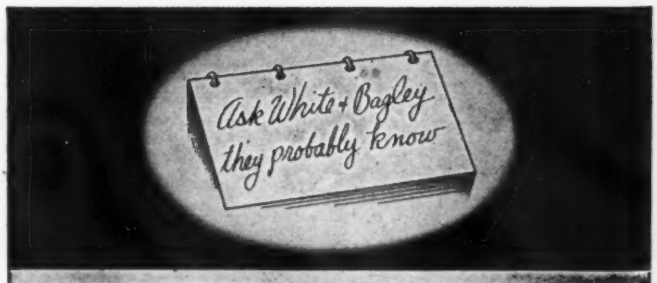
All Types of Fixed Center

DRILLING TAPPING & BORING HEADS

Four Spindle Head. All Spindles Adjustable for equally spaced holes.

UNITED STATES DRILL HEAD CO., CINCINNATI 4, OHIO

FIVE TYPES, 56 SIZES, ADJUSTABLE DRILL HEADS



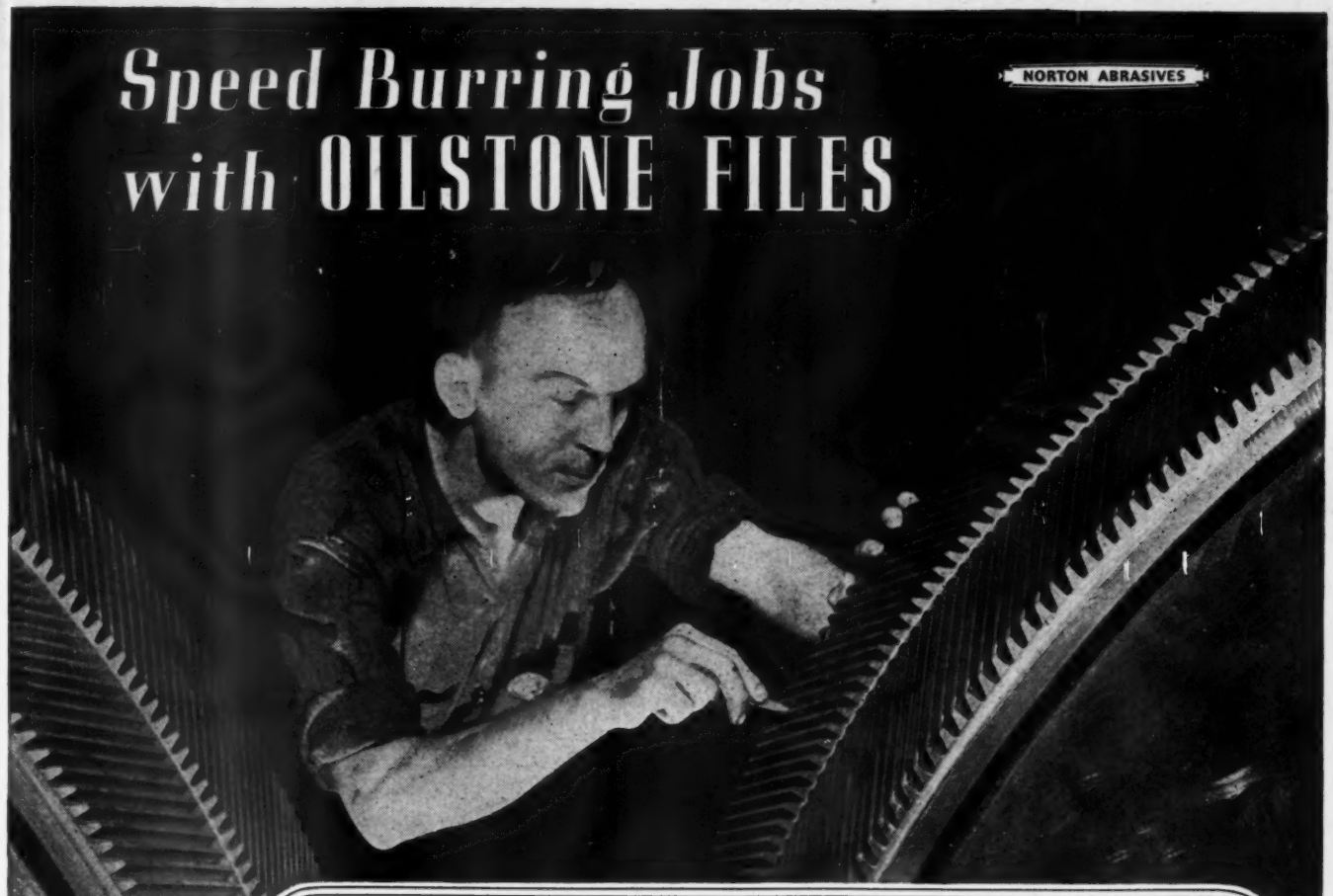
ECONOMY Grinding and Cutting Oils and Lubricants for Every Metal-Working Purpose

THE WHITE & BAGLEY COMPANY

WORCESTER, MASSACHUSETTS

Speed Burring Jobs with OILSTONE FILES

NORTON ABRASIVES



Grinding Wheel Grit ... and ALL File!

Whether it be the skillful stoning of the countless teeth in these giant reduction gears or single stroke passes on thousands of small machined parts—burring is a production operation—its cost, a production cost.

India Oilstone files, by Norton Abrasives, speed burring jobs—with a corresponding cut in production cost—for two reasons. They are made of aluminum oxide, grinding wheel abrasive, and they're all file—not just rows of cut teeth. They cut hardened steels as well as untreated, and permit easier control of stock removal.

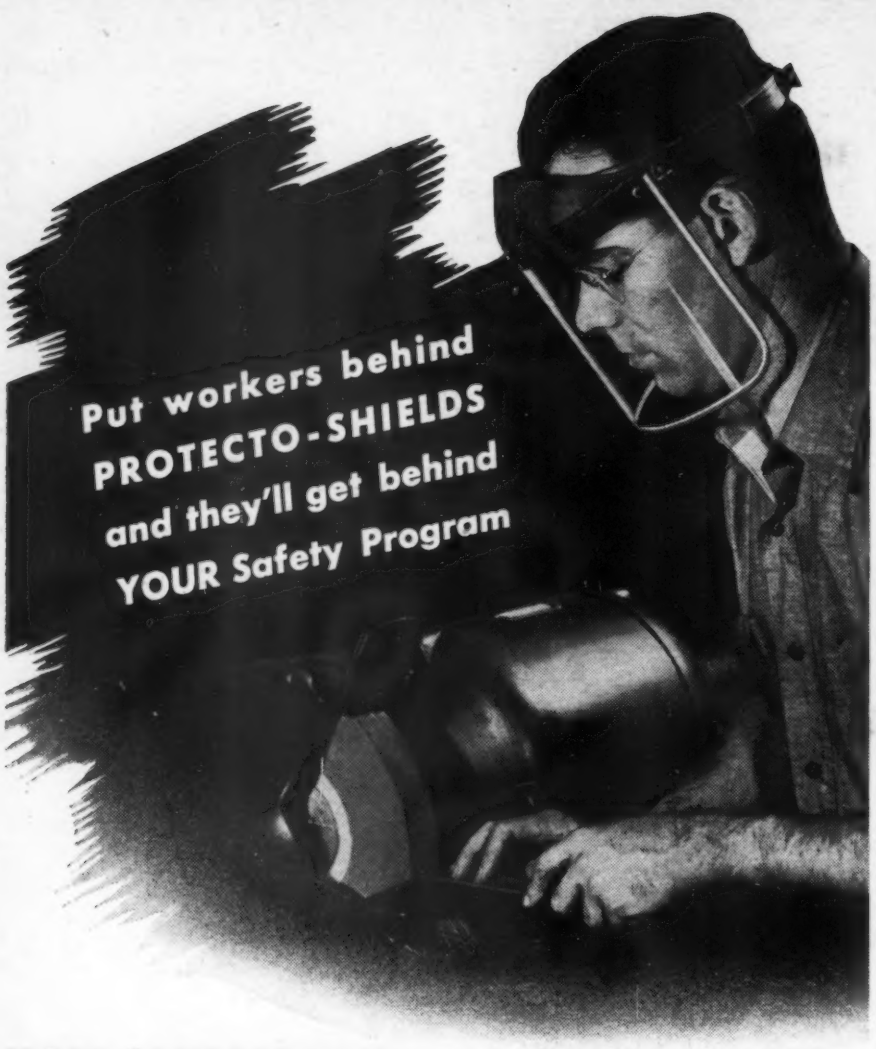
Factory oil-filled for greater chip clearance, India Oilstone files offer Industry a complete size and shape range of over a hundred standard stock items with a finish spread including coarse, medium and fine grits. Ask your distributor or write for booklet, "Oilstone Files."

Photo courtesy of Westinghouse Electric Corp.

BEHR-MANNING • TROY, N. Y.

(DIVISION OF NORTON COMPANY)

ALSO QUALITY COATED ABRASIVES SINCE 1872



MORE COMFORT MEANS EASIER ENFORCEMENT OF SAFETY REGULATIONS

The more comfort in the eye protection equipment you buy—the more willingness you'll find among workers to cooperate with your eye safety program.

For light grinding, wood working, spot welding and similar light duty operations, Willson Protecto-Shield* gives adequate protection. At the same time, its light weight, its cushioned headband and full visibility permit wearing all day without fatigue.

The visor, with rigid aluminum binding, is made of clear or Willson Tru-Hue green impact resisting plastic. Slot locks hold the visor securely in place and allow easy replacement. The headband is easily adjustable for all head sizes and a tough fibre guard protects the forehead area.

When not in use, the visor tilts up and "stays put."

Protecto-Shield comes in three lengths: 8", 6" and 4". Also available with side wings for protection against chemical splash.

For help with your eye and respiratory protection problems, get in touch with your Willson distributor or write direct.

GOGGLES • RESPIRATORS • GAS MASKS • HELMETS

DOUBLE WILLSON

PRODUCTS INCORPORATED

Established 1870

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WILLSON

TRADE MARK

The Lyon INTERNAL GROOVING TOOL

Its versatility saves costly preparation time—provides precision grooving of single or multiple grooves at a production rate—plus economy of set-up time—and low initial cost. The LYON has been designed for making internal grooves to tolerances of .001" using any drill press, turret lathe, radial drill or automatic equipment.

By changing only bushings and cutters within the tool model range, you have at your command a wide variety of bore sizes and shapes. A simple adjustment regulates location and depth of groove. Work cannot be scratched or marred because the head of the tool does not turn when the cutter operates.

Our Engineering Department will welcome the opportunity of discussing any grooving problem without obligation.

LYON MACHINE CO., WORCESTER 3, MASS.

L-W UNIVERSAL DIVIDING HEADS

Model AU Full Universal

for complete indexing and spiral cutting **$219.15**

HEADSTOCK—Ruggedly designed for maximum rigidity. Swivels to any angle.

TAILSTOCK—Heavier, stronger.

HEADSTOCK SPINDLE — Tapered bearings, bored for No. 10 B & S Taper. Increased diameter and length. Threaded nose, 2¼" diameter 10 thread USS.

WORM—Special alloy steel, accurately finished, end thrust taken by ball bearings. Easy, accurate adjustment of worm wheel.

WORM WHEEL—Large diameter, 40:1 ratio, accurately generated, securely mounted on spindle.

EQUIPMENT—⅝" table slot tongues, three index plates, dividing all numbers to 50, and even numbers to 100, with the exception of 96T. Index chart shows all divisions obtainable to 380. When ordering AU Heads, specify either right or left hand model.

Model BP $151.20

For plain milling machine

L-W 11" HIGH QUALITY DIVIDING HEADS AFFORD UTMOST ACCURACY AT A COST LOWER THAN ANY COMPARABLE EQUIPMENT

Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products

L-W CHUCK COMPANY 25 SO. ST. CLAIR ST. TOLEDO 4, OHIO

big news
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You know that your Government is offering a wide range of choice plants for sale or lease—on attractive terms.

What you may not know, is the exceptionally favorable position of so-called "small business" in acquiring these properties for its particular needs.

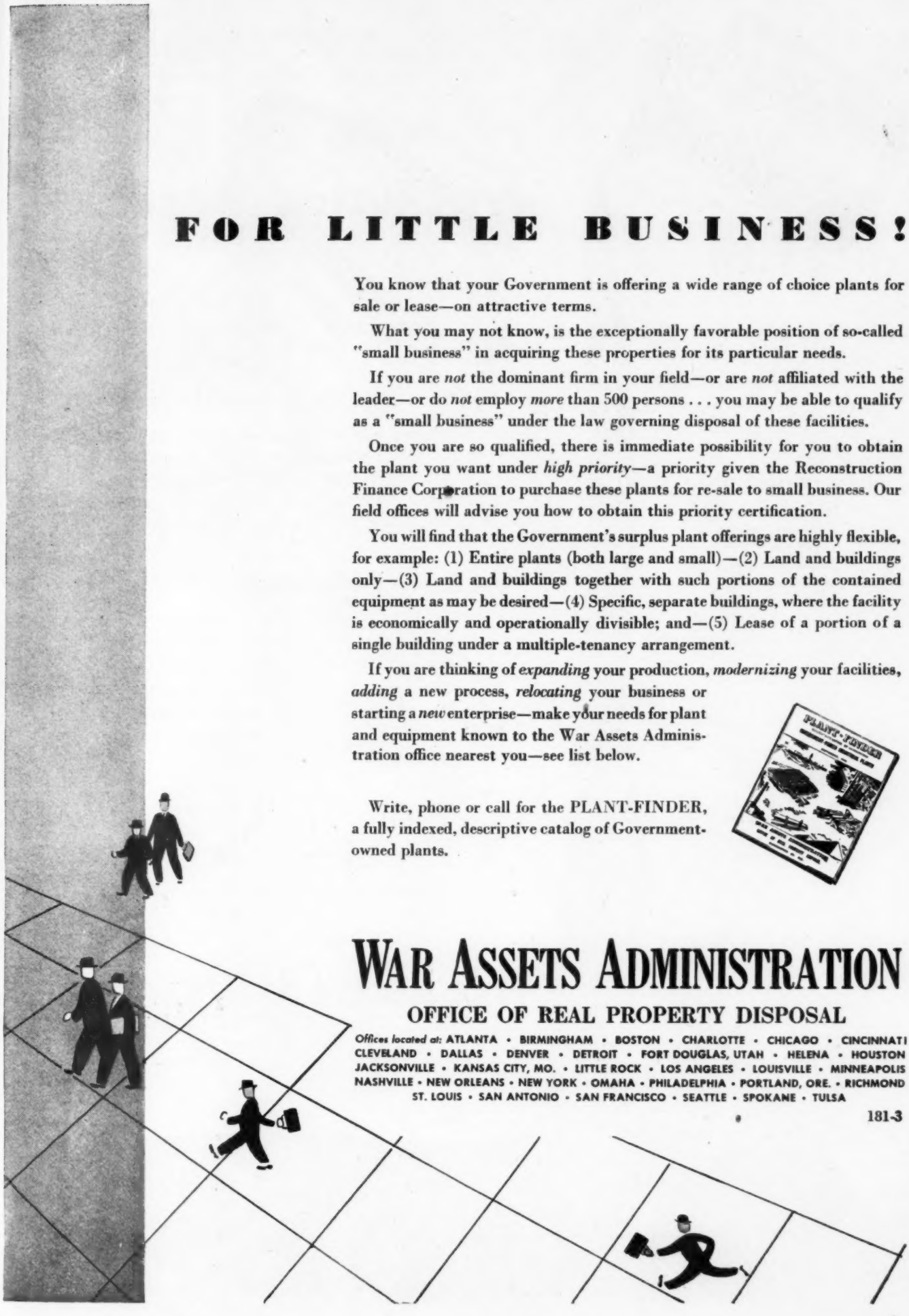
If you are *not* the dominant firm in your field—or are *not* affiliated with the leader—or do *not* employ *more* than 500 persons . . . you may be able to qualify as a "small business" under the law governing disposal of these facilities.

Once you are so qualified, there is immediate possibility for you to obtain the plant you want under *high priority*—a priority given the Reconstruction Finance Corporation to purchase these plants for re-sale to small business. Our field offices will advise you how to obtain this priority certification.

You will find that the Government's surplus plant offerings are highly flexible, for example: (1) Entire plants (both large and small)—(2) Land and buildings only—(3) Land and buildings together with such portions of the contained equipment as may be desired—(4) Specific, separate buildings, where the facility is economically and operationally divisible; and—(5) Lease of a portion of a single building under a multiple-tenancy arrangement.

If you are thinking of *expanding* your production, *modernizing* your facilities, *adding* a new process, *relocating* your business or starting a *new* enterprise—make your needs for plant and equipment known to the War Assets Administration office nearest you—see list below.

Write, phone or call for the PLANT-FINDER, a fully indexed, descriptive catalog of Government-owned plants.



WAR ASSETS ADMINISTRATION

OFFICE OF REAL PROPERTY DISPOSAL

Offices located at: ATLANTA • BIRMINGHAM • BOSTON • CHARLOTTE • CHICAGO • CINCINNATI CLEVELAND • DALLAS • DENVER • DETROIT • FORT DOUGLAS, UTAH • HELENA • HOUSTON JACKSONVILLE • KANSAS CITY, MO. • LITTLE ROCK • LOS ANGELES • LOUISVILLE • MINNEAPOLIS NASHVILLE • NEW ORLEANS • NEW YORK • OMAHA • PHILADELPHIA • PORTLAND, ORE. • RICHMOND ST. LOUIS • SAN ANTONIO • SAN FRANCISCO • SEATTLE • SPOKANE • TULSA

181-3

HYDRAULIC and RECOIL Oils

at low cost . . . . . from 16¢ per gallon

Here is your chance to get top-grade hydraulic and recoil oils. For detailed specifications get in touch with the nearest War Assets Regional Office listed below. Tell them what you want and how much of it. It's simple, fast, economical!

MINIMUM QUANTITIES

No sales shall be made involving a quantity less than 250 gallons, except where the regional office inventory of the specific item is less.

This material is offered in the following sequence as provided by law:—(1) Certified Veterans of World War II; (2) Subsequent priority claimants; (3) Non-priority purchasers. Federal agencies have had opportunity to fulfill their needs. VETERANS OF WORLD WAR II should apply to their nearest WAA Regional Office for certification; the date and case number assigned and the location of the certifying office must be stated in a Veteran's offer to purchase.

EXPORTERS: This material is available for export. Any question on export control should be referred to Office of International Trade, Department of Commerce, Washington, D. C.

Regions Holding Inventories of These Oils

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Boston	Minneapolis
Chicago	New York
Cleveland	New Orleans
Dallas	Philadelphia
Denver	Seattle
Detroit	St. Louis
Helena	Salt Lake City
Houston	San Francisco
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WAR ASSETS ADMINISTRATION

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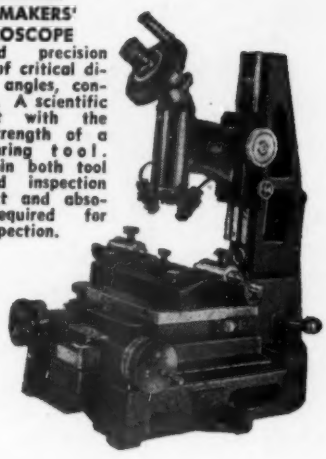
Offices located at: Atlanta • Birmingham • Boston • Charlotte • Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit • Fort Douglas, Utah • Fort Worth • Helena • Houston • Jacksonville • Kansas City, Mo. • Little Rock • Los Angeles • Louisville • Minneapolis • Nashville • New Orleans • New York • Omaha • Philadelphia • Portland, Ore. • Richmond • St. Louis • San Antonio • San Francisco • Spokane • Seattle • Tulsa

T90

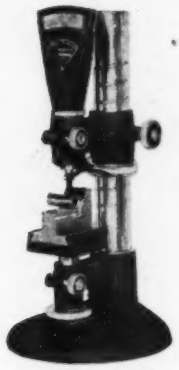
Magnifies surface details as well as contour

GAERTNER TOOLMAKERS' MICROSCOPE

For rapid precision checking of critical dimensions, angles, contours, etc. A scientific instrument with the rugged strength of a manufacturing tool. Valuable in both tool room and inspection department and absolutely required for thread inspection.

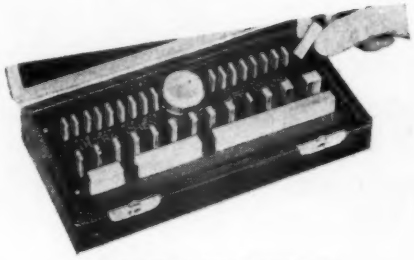


Presenting the new improved WILDER PROJECTOR



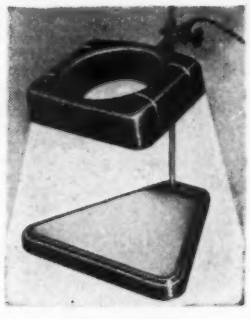
COMPARITOL

For quick checking of duplicate work visually, to 1/10000th. Separate anvils and contact points to suit a variety of work. No electrical contacts, no heating up period, no pivots, bearings, backlash, etc. The most reliable comparator for all measuring purposes.



ULTRA-CHEX GAGE BLOCKS
.000005 accuracy guaranteed

A 34-block set of standards giving 80,000 combinations in steps of 1/10,000. Set includes optical parallel for testing flatness and wear.



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Magnifies and floodlights object under inspection. Can be removed from base and used as hand magnifier. Used by the hundred in both inspection and production departments. Several types for different needs.

SPENCER BINOCULAR MICROSCOPE

Permits three-dimensional vision at high magnification in inspecting small parts, contours, surface finish, etc. Choice of objectives, .7 x to 8 x and of eyepieces, 9 x to 18 x. Essential wherever materials must be inspected for surface flaws, scratches, irregularities.

SURFACE FINISH STANDARDS

When used with Spencer Microscope, aids uniformity in surface finish by supplying comparison standards. All specimens clearly marked and graded.

Now you can locate and check any points within the area of a projected image. The Surface Illuminator (patent applied for) of the new Wilder Projector throws on the ground glass screen a clear, magnified picture of the part under inspection, with not only the edges, but every inside detail strongly shown.

This much-needed advance in projection equipment for shop use vastly increases the value of the Wilder Projector, already universally known for its positive aid in checking gear tooth forms and similar work. Here is a precision instrument of laboratory refinement, with all the sturdiness of a shop tool for everyday use, and priced within the budget of any shop that needs it. Deliveries are good.

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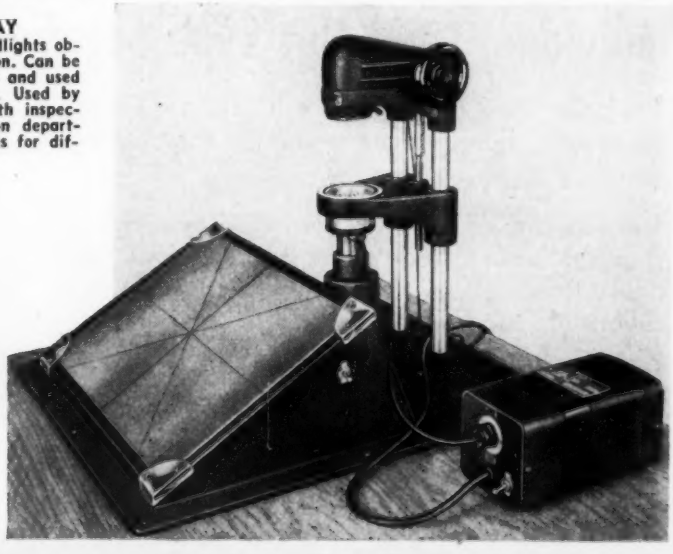
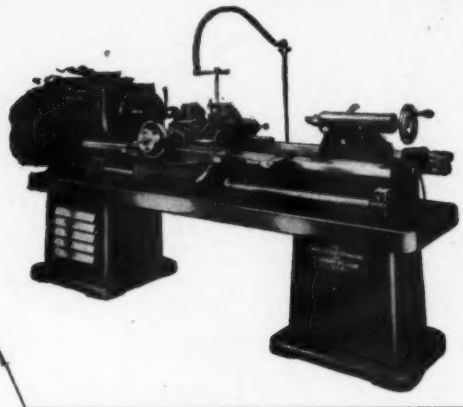
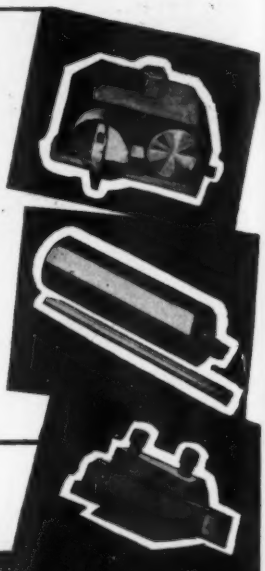


GEO. SCHERR CO., Inc. 201 LAFAYETTE STREET NEW YORK 12, N. Y.

40 YEARS OF EXPERIENCE produced THE NEW COULTER AUTOMATIC THREADING LATHE





The many different and number of threading tools which can be arranged on the tool slides both front and rear, make this machine the most versatile of any for production of square, standard, and 29 degree threads, both internal and external.

Equipped with disc clutch. . . . Easy to operate. . . . Rigid Construction. . . . Four speed headstock. . . . Return or Idle travel speed has been increased five times cutting speed.

PRODUCTION MACHINES SINCE 1896

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The James COULTER *Machine Co.*

BRIDGEPORT • CONNECTICUT • U.S.A.

Heavy Duty TAPERED PIPE TAPPING *Easy With* BUHR *TAPPING HEADS!*

When production problems arise—consult Buhr for the solution . . . Specialists in multiple spindle drilling, reaming and tapping equipment for over 25 years. We have helped many manufacturers speed production for greater profits.

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Taper tap feed and collapsing mechanism is enclosed at rear of head under motor mounting bracket.

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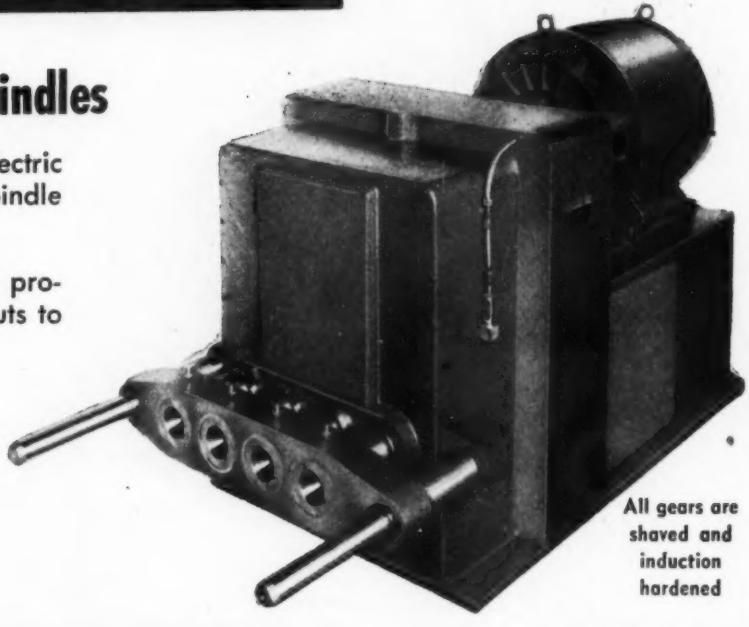

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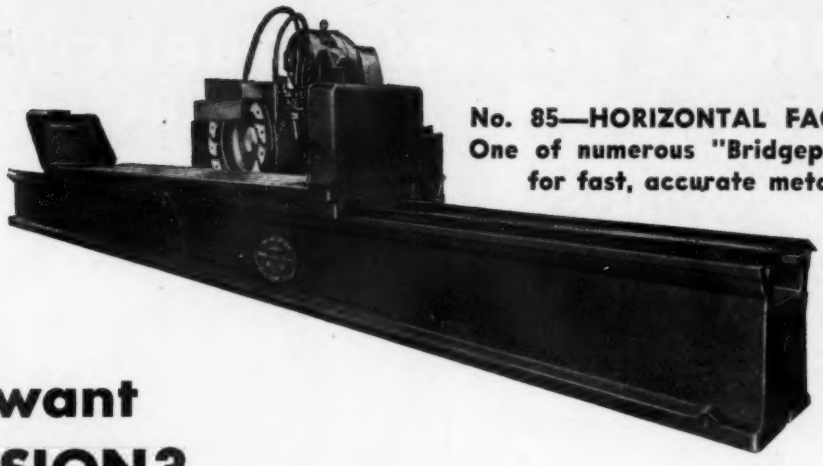

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One of numerous "Bridgeport" machines for fast, accurate metal removal

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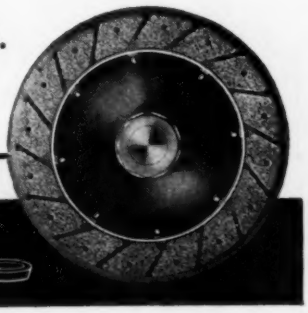

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THE TURRET LATHE *Your Operator* APPROVES!

EASY TO OPERATE • ACCURATE
DEPENDABLE • RIGID AND
POWERFUL ENOUGH TO FULLY
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CARBIDE TOOLS

#4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length 19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM.
constant speed motor, 1200 RPM
MAY BE HAD WITH PLAIN CROSS SLIDE

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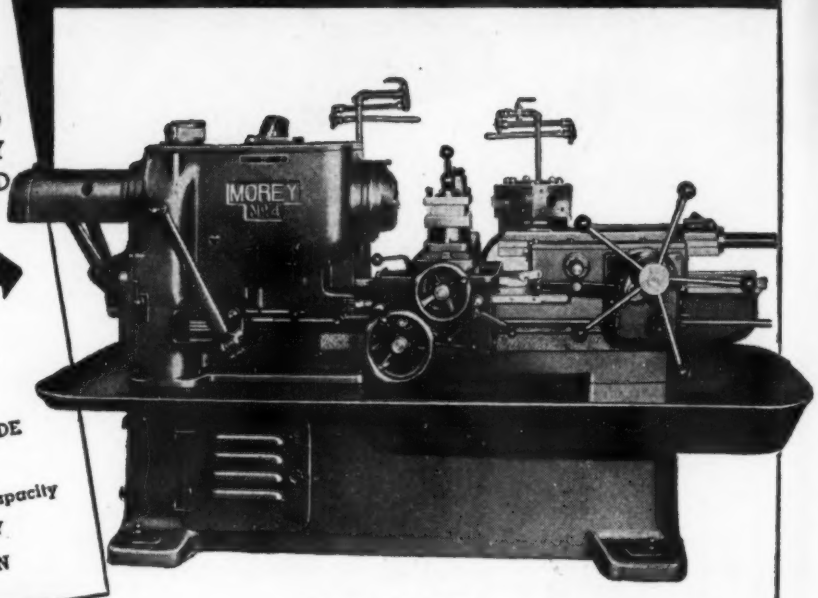

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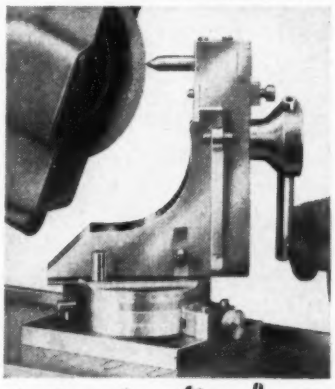
The makers of **LIONEL ELECTRIC TRAINS**
give four reasons for their choice of

"Fluidmotion"* RADII and ANGLE DRESSERS



1. Exceptional accuracy of "Fluidmotion" in all phases of form dressing.
2. Much easier set-up and operation.
3. "Fluidmotion" allows them to dress the entire angle-radius-angle profile on wheel in *one continuous motion* — with just *one* set-up.
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"Fluidmotion" FEATURES:

- *.0001" accuracy*
- *Automatic centering*
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- *Dustproof and chatterless*
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- *Highest quality diamonds*

These are basic reasons for the choice of "Fluidmotion" Radii and Angle Dressers at Lionel and other well known plants throughout the country. There's a standard "Fluidmotion" Radii & Angle Dresser for most requirements. Send for descriptive bulletins.

*Reg. U. S. Pat. Off.

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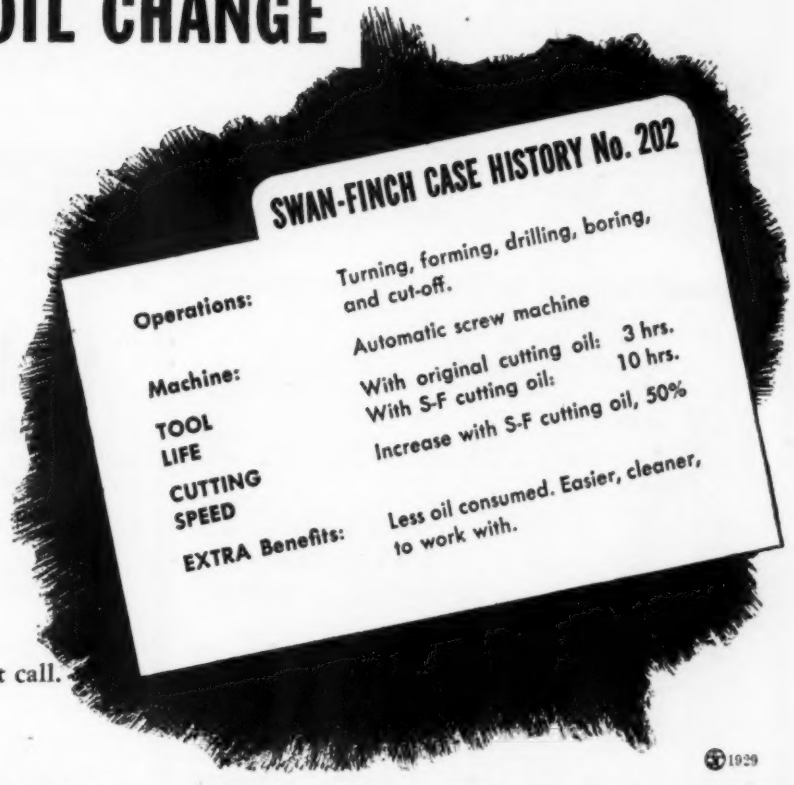
50% faster cutting

AFTER CUTTING OIL CHANGE


SWAN-FINCH CASE HISTORY No. 202
Operations: Turning, forming, drilling, boring, and cut-off.
Machine: Automatic screw machine
TOOL LIFE: With original cutting oil: 3 hrs. With S-F cutting oil: 10 hrs.
CUTTING SPEED: Increase with S-F cutting oil, 50%
EXTRA Benefits: Less oil consumed. Easier, cleaner, to work with.

Any plant—yours for example—might profit like this from a visit by a Swan-Finch man. Because *any* problem of metal-working lubrication is his concern. It's his interest in what you're doing—and how you can do it *better* — that makes the difference. The cutting oils he recommends . . . after first-hand study of specific conditions . . . increase production, make longer tool life possible — like cutting oils bought from an impersonal catalog never could!

Decide today to let a Swan-Finch man—backed by Swan-Finch 90-year experience—take a crack at your lubricating problem. There's no obligation, no cost—and *no interruption to production* — linked to his short call. Coupon below brings him.

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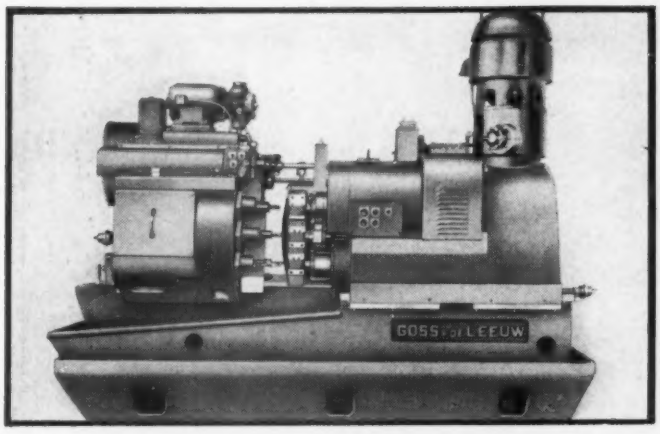

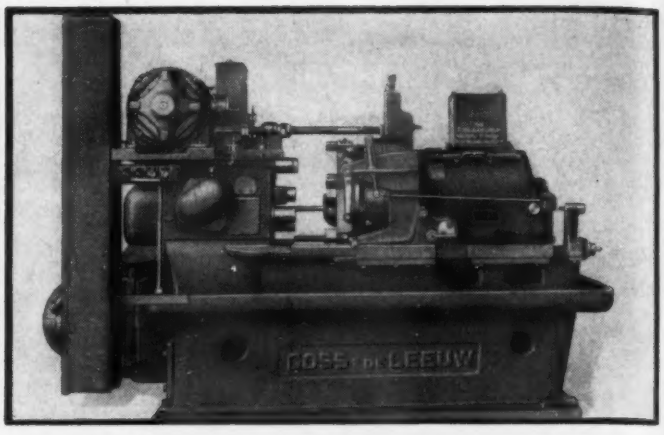

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES

TOOL ROTATING TYPE
4 Spindles
5 Chucking Positions

Features include:

Lead Screw Threading on both types—Preloaded Anti Friction Spindle Bearings—Hardened Ways—Oversize Spindles—Gears of Chrome-nickel steel, carefully heat-treated.

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EASY TO HANDLE
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It is an all purpose attachment which has thoroughly proved itself all over the world. Ideal for the making of plastic molds, die casting molds, permanent mold casting molds, metal patterns, tool and die making, production work of all kinds, as well as for grinding, drilling, boring, etc.

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The M & N Hydraulic Hobbing Press has been designed with exclusive features to meet the demand for accuracy in heavy duty die work and the precise requirements of modern tool room and mold shops. This NEW press has been successfully used for blanking, forming and drawing of heavy materials.

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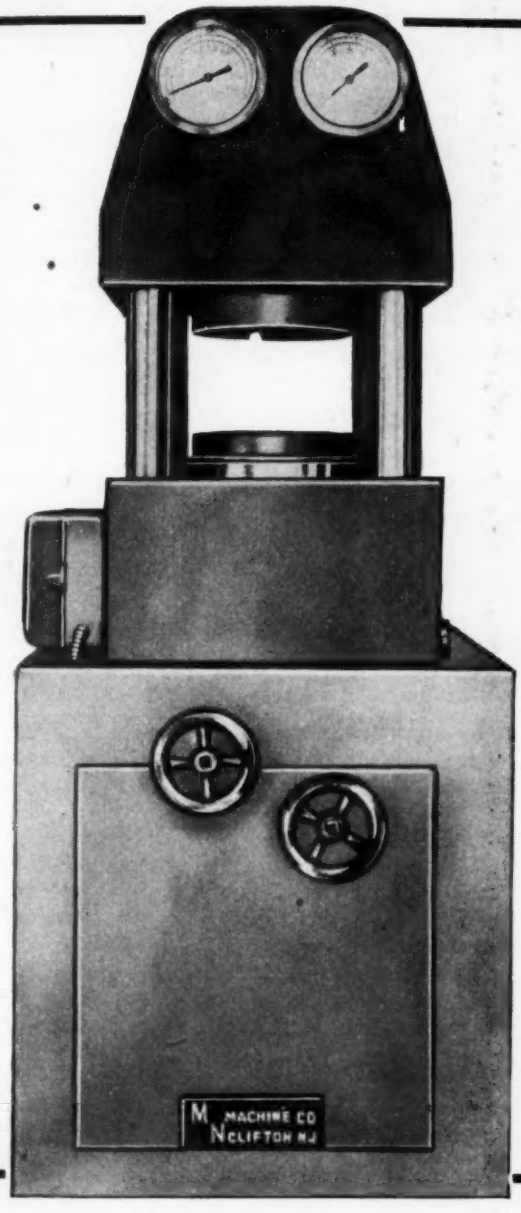


Condensed Specifications

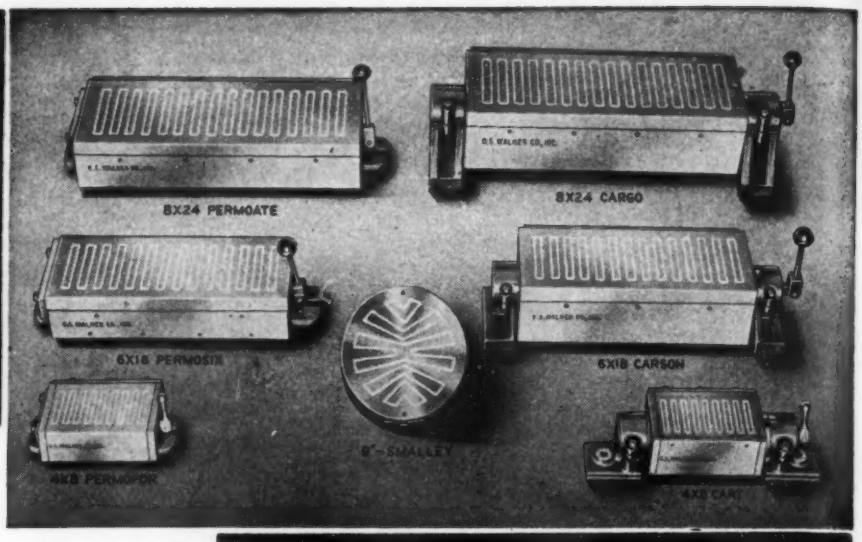
(Model 13 AS2M Illustrated)

Capacity, Tons	400
Ram, dia., inches	13
Daylight Opening, inches	12
Stroke, inches, max.	4½
Height to platen, inches	42
Overall height, inches	72
Floor Spaces, inches	28 x 28
Approx. weight, lbs.	2450

M & N MACHINE TOOL WORKS

152 ORONO ST., CLIFTON, NEW JERSEY

Walker Chucks



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Over 60 years of chuck building, design, and engineering experience is incorporated into these PERMOS.

WALKER ENGINEERS invite you to present your problems for solution at no obligation.

REMEMBER there is a WALKER CHUCK for every known application.

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In these efficient centrifugal machines the washing solution enters the top of the whirling load under valve control. The operating principle—being that of a typhoon—gives the washing solution a spraying, swirling, and surging action which thoroughly permeates the contents. During this action, centrifugal force creates hydrostatic pressure within the basket, That proportion of the deluge going to the bottom is forced up the side and out carrying off the contaminated fluid.

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As in all Barrett Centrifugal machines, provision is made for convenience and safety of operation.

Send at once for details of Barrett Typhoon Washer

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Send for your free copy of the new Delloy catalog. You'll find it full of helpful information on cutting, grinding and welding.

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CUTTING TOOLS

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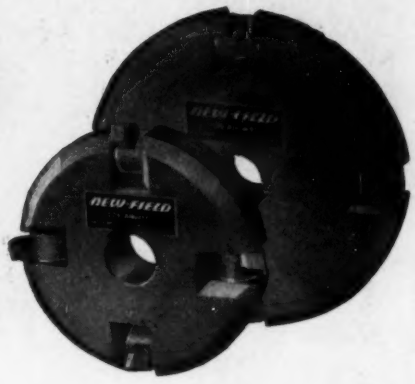
Minimum Investment - Maximum Production

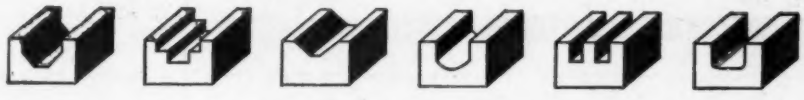
NEW-FIELD *Universal* FLY CUTTERS



. . . ***REDUCE*** **inventory and maintenance costs.**

. . . ***SAVE ON*** **time, labor and expense.**

. . . ***BECAUSE*** **one easily adjustable New-Field Fly Cutter performs a variety of production jobs.**



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MORE CHIP REMOVAL per horsepower with New-Field Fly Cutters. Regular models; 4" to 10" diameters—⅝" to 1" widths. 'Extra Heavy 6" and 8" diameters—1⅜" width.

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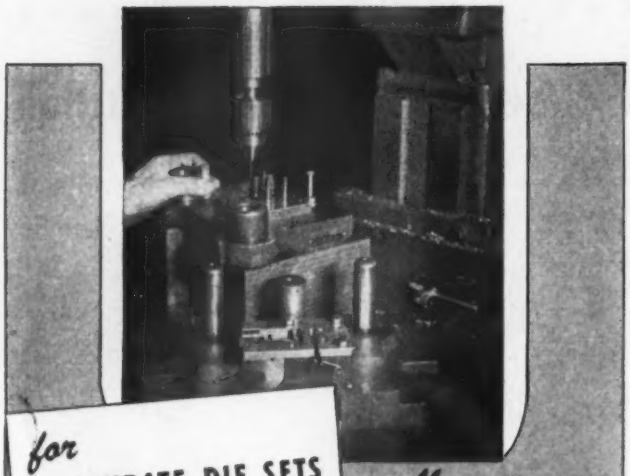

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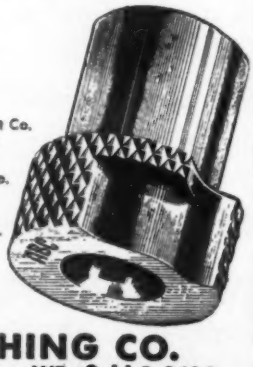

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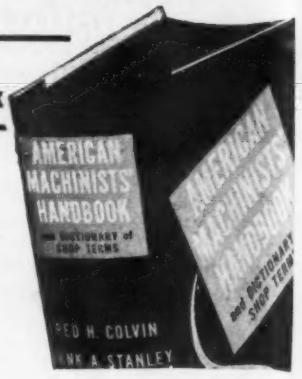
4 { AIDS TO BETTER } Machine-shop methods / Plant Management

American Machinists' Handbook



By FRED H. COLVIN, *Editor Emeritus, American Machinist* and FRANK A. STANLEY, *Formerly Editor, Western Machinery and Steel World.* Eighth edition. 1546 *pages,* 2500 *illustrations,* 4½x7, $5.00

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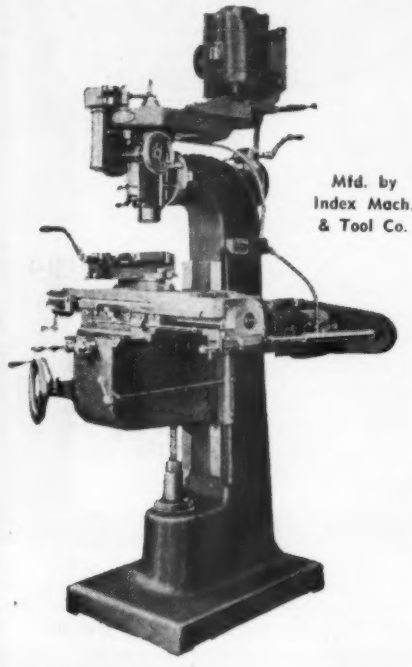

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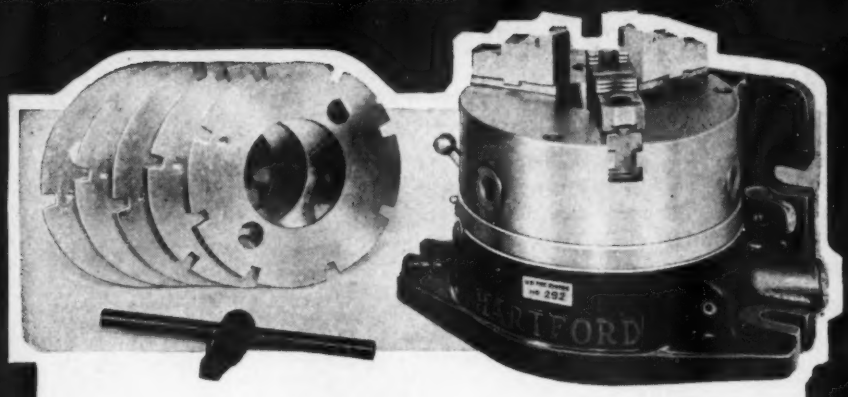

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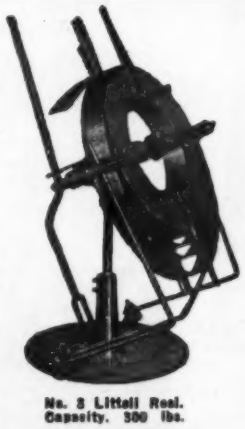

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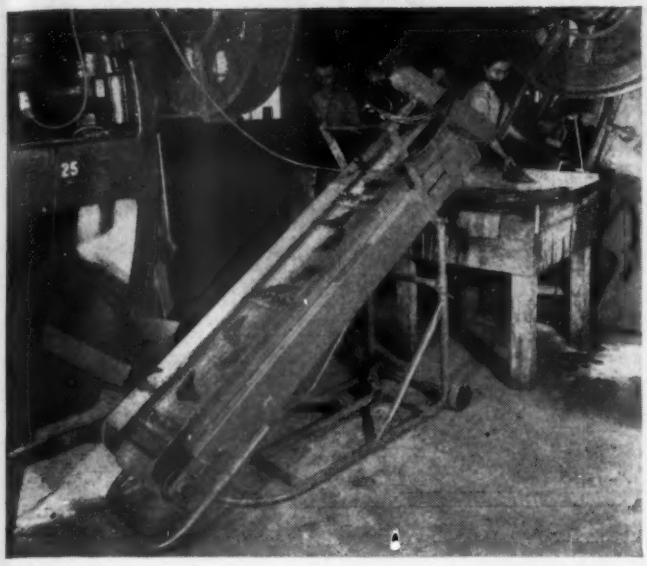

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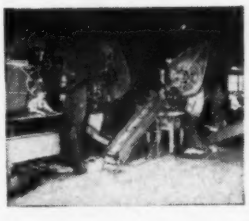

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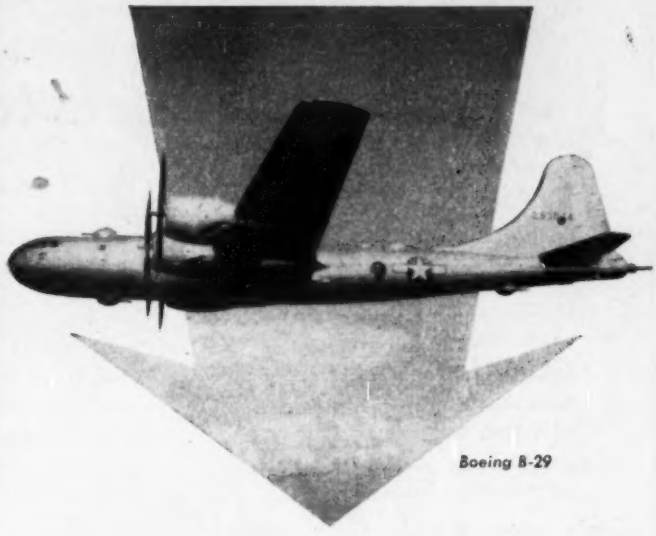

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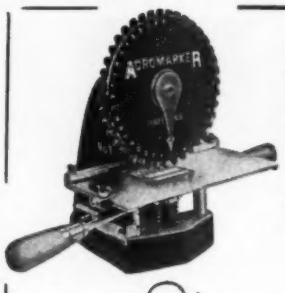

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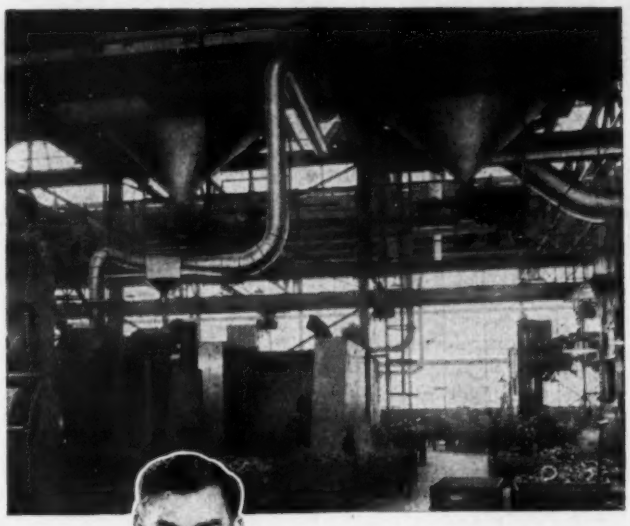

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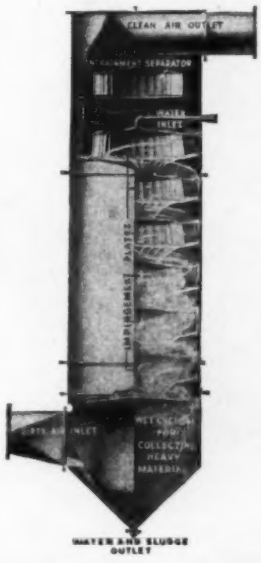

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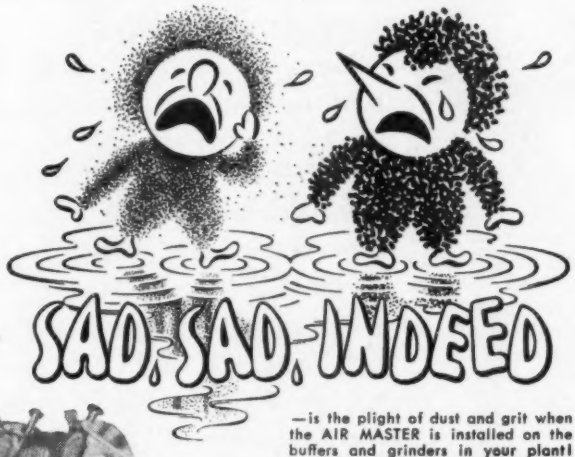

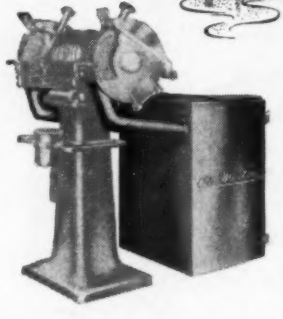

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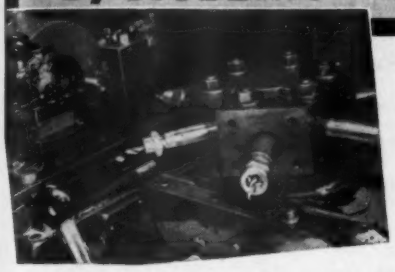

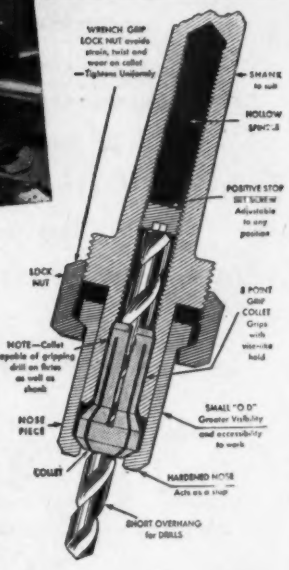
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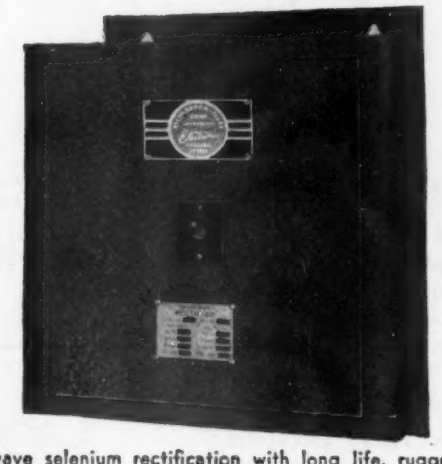

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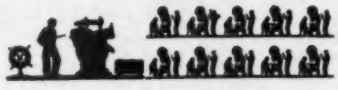

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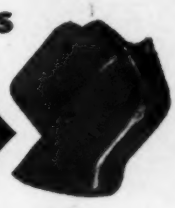

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BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS—WALTHAM CUTTER SHARPENERS

Better cutting fluids mean Better Machining

Stuart's

ThredKut

... America's No. 1 heavy-duty cutting Oil for the toughest metal cutting jobs!

FOR FURTHER INFORMATION WRITE

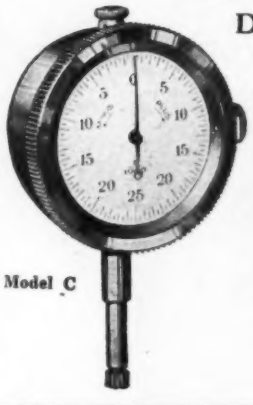
D.A. Stuart Oil CO.
EST 1862 LIMITED

2729 SOUTH TROY STREET, CHICAGO 23, ILL.

Stuart Oil Engineering Goes With Every Barrel

RANDALL and STICKNEY

Dial Gauges and Indicators



Model C

are accurate, reliable and built to stand the gaff of hard usage.

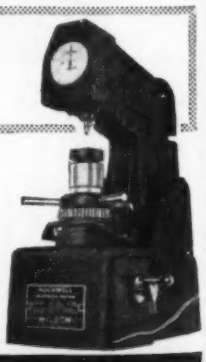
This Model C Dial Indicator has a 2¼ in. diameter dial, with 50 or 100 divisions. Can be furnished in graduations of .001-in., .0005 in. or .01 mm. Has a ½-in. range movable dial easily set at zero.

The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two sperarate units, so that repairs can be made easily.

There is a R. & S. Gauge for practically every purpose. Write for circulars describing our complete line.

FRANK E. RANDALL CO.
248 Ash St.
Waltham 54, Mass., U. S. A.
Makers of Dial Gauges Since 1885

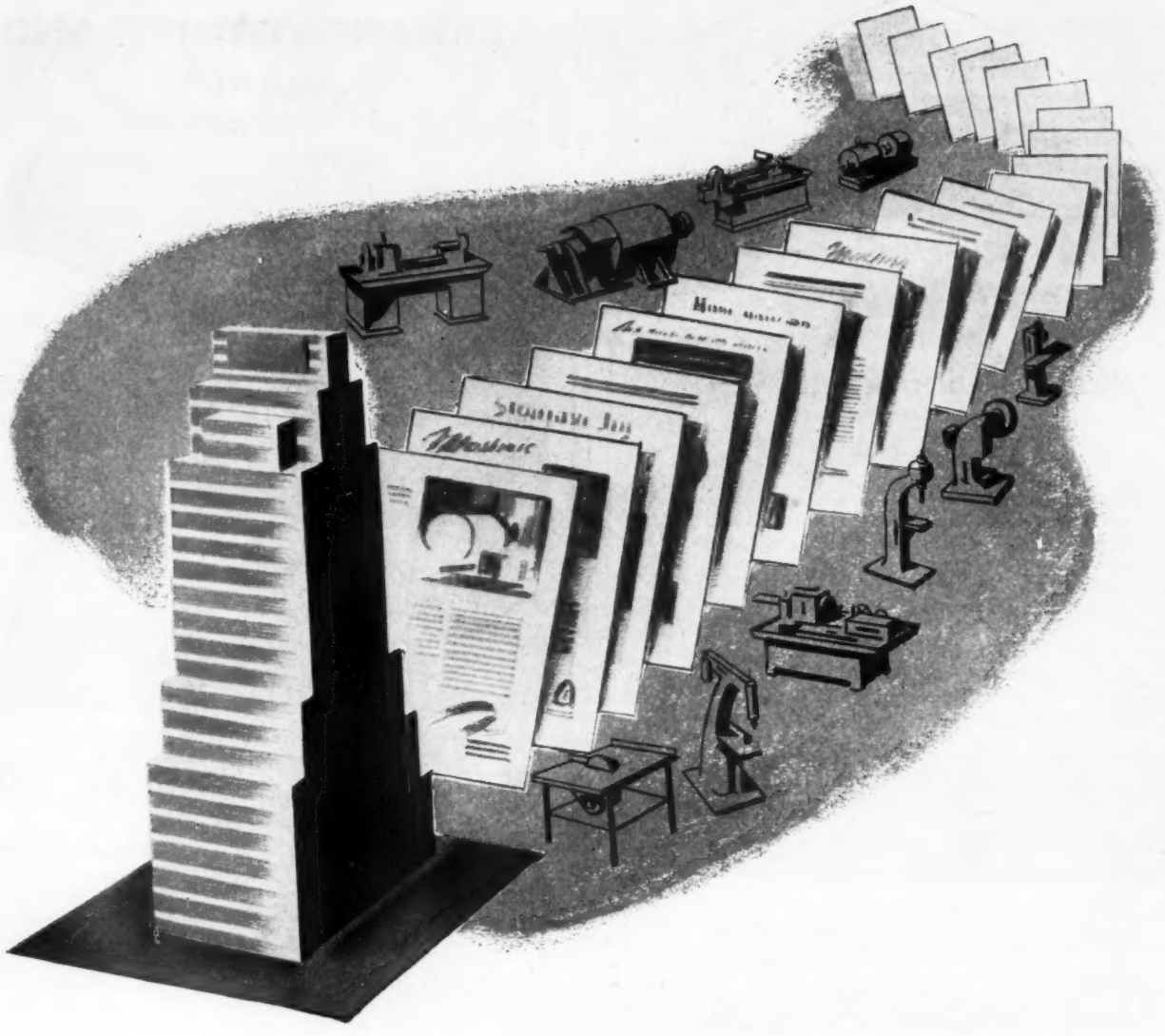
IMPROVEMENTS IN LATEST MODELS



There are 9 improvements in the new "ROCKWELL" Hardness Tester offered today. Many or all of these improvements are lacking in models not made recently.

ACCO

WILSON MECHANICAL INSTRUMENT CO., INC.
AN ASSOCIATE COMPANY OF AMERICAN CHAIN & CABLE COMPANY, INC
357 CONCORD AVE., NEW YORK 54, N. Y.



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WEIGHT MUST BE MOVED
AND ECONOMY DICTATES
PORTELVATOR

You'll find a thousand jobs for Portelvator, the rugged portable elevating table with ease of operation and stability built-in. • Use as a level under overhanging work, to raise or lower heavy dies and castings to machine height, to fetch and carry, to load and unload, to charge and discharge heat treating furnaces, as a tough and willing helper to every man in your shop. • Made in three standard models with carrying capacities ranging from 1,000 to 5,000 pounds. Special models built to meet "out-size" specifications. • Equip your shop with Portelvator and watch your production mount. Write for literature and prices . . . Address Department D-P.

THE Hamilton TOOL COMPANY
SUPER SENSITIVE DRILLING MACHINES · TAPPING MACHINES · PORTELVATORS
NINTH STREET AT HANOVER · HAMILTON · OHIO · U·S·A

SAVE HANDS WITH STRANDS
Safguards
FOR PUNCH PRESSES

Write for descriptive bulletins to get the important facts

STRAND MANUFACTURING CO., INC.
SAFETY ENGINEERS
600-13 WEST LAKE ST. CHICAGO 6, ILL.

The Fight Against Friction!

"How To Lubricate Metalworking Machines"—one of the most popular Special Reports ever run in *American Machinist*—has been reprinted! Copies are available in reasonable quantities.

This 16-page survey on an ever-important subject tells, with text, tables, and technical illustrations, about lubricants, their sources and compositions, their most efficient use, and their care and handling. Special sections describe the leading tests for lubricants and give the story on what's ahead in the lubrication field. A table describes general lubrication recommendations for machinery tools including parts to be lubricated, grade of lubricant that should be used, and a description of the qualities necessary.

If you would like copies for your technical or field staff, please write giving the number required and enclosing 10¢ each for costs of handling and mailing.

FOR COPIES WRITE:
Readers Service Department

AMERICAN MACHINIST
330 WEST 42nd STREET
NEW YORK 18, N. Y.

CONTRACT WORK

WANTED PRODUCT OF CONTRACT WORK

Machinery manufacturing concern with extensive experience desires a product to manufacture on a contract basis or straight contract work.
Manufacturer has modern well equipped machine shop, capable of making small, medium or large machinery, tools, jigs, fixtures, gages, stamping dies, stampings, electronic assemblies, gear drives and small parts of all types. Excellent engineering facilities and good contacts for all types of foundry work are available.

Send for our bulletin #10A

C. W. JARVI MFG. COMPANY, INC.
NORTH ATTLEBORO MASSACHUSETTS

SPECIALTIES—PRECISION WORK

Available capacity for automatic screw machine products up to 1⅝" diameter.

Equipped for secondary operations: Thread rolling and chasing, centerless grinding slotting, drilling, heat treating, and plating.

Forward blueprints for quotations. Prompt-efficient service.

JOHN L. BUXTON CO.
2540 Reed Street Philadelphia 46, Pa.
Tel.: FULton 0628 and 0629

La Salle Engineering Co.
TOOLS, PRODUCTS, SPECIAL MACHINES; DESIGN & BUILD
CHICAGO
LOS ANGELES
NEW YORK

FOR PROMPT ANSWERS
to your business problems
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Electrical World
Electronics
Engineering and Mining Journal
Engineering News-Record
E. & M. J. Markets
Factory Management and Maintenance
Food Industries
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Product Engineering
Textile World
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McGRAW-HILL PUBLISHING CO., INC.
NEW YORK 18, N. Y.

HOBBING PRESSES

Self contained units for prompt delivery 11" Left to right 18" Front to back for Hobbing mold cavities die sinking Etc.

M&N MACHINE TOOL WKS.
149 Orono St. Clifton, N. J.

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them.
GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

SEND B.P. FOR MFG. COMPLETE ASSEMBLIES
Tool—Jigs—Dies
Screw Machine and Turret Lathe Work
Stampings—Gears
POSSY'S TOOL & MFG. CO.
51 Meadowbrook Buffalo 6, N. Y.

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

POSITION VACANT

WANTED: Experienced Machine Tool Salesman. Excellent opportunity, traveling Indiana, southern Ohio and northern Kentucky territory. Should be mechanical engineer with successful selling record on machine tools and hydraulic machinery. Write full details of education and experience which will be kept in confidence. P-819, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

EMPLOYMENT SERVICE

SALARIED POSITIONS $2,500-$25,000. This thoroughly organized confidential service of thirty-six years' recognized standing and reputation carries on prelmiinary negotiations for supervisory technical anexecutive positions of the calibre indicated through a procedure individualized to each client's requirements. Retaining fee protected by refund provision. Identity covered and present position protected. Send only name and address for details. R. W. Bixby, Inc. 266 Dunn Bldg., Buffalo 2, N. Y.

POSITIONS WANTED

CHIEF GEAR Engineer with twelve years experience in gear design, gear tooling and production; also diversified tooling and production experience. Location eastern United States. PW-797, American Machinist, 330 W. 42nd St., New York 18, N. Y.

MACHINE DESIGNER WANTED
BY MANUFACTURER OF NATIONALLY KNOWN HIGH PRECISION INSTRUMENTS

For the Creation of Specialized Automatic Production Equipment. Experience and Inventive Ability Essential.

Write Complete Details to

P-815, AMERICAN MACHINIST
330 West 42nd Street New York 18, N. Y.

Positions Wanted

EXECUTIVE ENGINEER — Plant Manager, Chief Engineer, Production Manager. Mechanical, Electrical, Metallurgical Engineering Education. Twenty-five years broad practical experience. Conversant with all phases of job shop and mass production manufacturing, including research, product design and development, tools, methods, production control, quality economically and harmoniously. Excellent references. PW-821, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

Positions Wanted

PRODUCTION ADMINISTRATIVE Executive: 25 years of unusual and successful "Management" background. Thoroughly experienced in all phases of "Plant" and "Administrative" procedures, controls and methods. Positions held in capacity of Works Manager and Chief Industrial Management Executive. New York vicinity preferred. PW-819, American Machinist, 330 W. 42nd St., New York 18, N. Y.

(Continued on page 301)

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE

(Not available for equipment advertising)

10 cents a word minimum charge $2.00.

(See ¶ on Box Numbers.)

POSITIONS WANTED (full or part-time individual salaried employment only), ½ above rates.

PROPOSALS, 50 cents a line an insertion.

INFORMATION

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED RATE:

The advertising rate is $8.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. A.M.

NEW ADVERTISEMENTS received by 10 A.M. December 4th will appear in the issue of December 19th subject to limitation of space available

WANTED

DESIGN ENGINEER

Excellent opportunity for Jig and Fixture Design engineer with mechanical engineering degree or equivalent. Must have experience and ability to take complete responsibility for administering and directing a small Design Engineering department.

P-804, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

BUSINESS INVESTMENT

Men who wish to actively engage in the operation of a drop forging plant & manufacturing machine shop are invited to participate in the organization of a new corporation which would purchase the real estate and equipment of a modern small plant that will be sold during December '46 at a very attractive price. Wonderful opportunity for investing $10,000 to $15,000 in a business that should net $65,000 to $85,000 income in one year with present facilities. Excellent products.

PROMPT ACTION NECESSARY

***For Details Contact* T. H. COVINGTON**

PHONE 416 **BOWLING GREEN, KENTUCKY**

POSITIONS WANTED

(Continued from page 301)

PERSONNEL—Labor Relations Manager—12 years experience. Nationally known corporations. All phases personnel administration. Contract and afge negotiations, grievances, safety, cost and quality controls, some production. Organized 2 personnel departments. Prefer New England. Would like combination personnel and assistant production manager. American, age 40, married, 2 children, college, Christian. Salary $5,000 to $7,500. PW-809, American Machinist, 330 W. 42nd St., New York 18, N. Y.

TOOL, DIE and Model Maker, Also Tool Trouble Shooter, 35 years practical experience, desires connection with progressive concern in Supervisory Capacity. PW-820, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

PRODUCT DESIGNER, 44, with past experience as Factory Superintendent, Mechanical Research Engineer, tool and die maker, wishes a connection, preferably in the Mid-West or South West, to do product design, sales engineering or factory supervision. From a product design standpoint, my experience will permit me to cooperate satisfactorily with both the sales and the production departments and may include the complete experimentation, design of product, design of tooling, and active help in the plant and with the sales department. Brandt Ford, 136 Ransom Ave., Sherrill, N. Y.

SELLING OPPORTUNITY OFFERED

WANTED By manufacturers agent; New York and Lower New England territory, Mechanical Specialties or tools selling to Machinery Manufacturers and Machine shops. Include full particulars. RW-822, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SELLING OPPORTUNITIES WANTED

ESTABLISHED IMPORT & export firm located in Shanghai, China desires additional connection with leading manufacturers. References furnished. Address: Ray Snyder c/o Dean Company, 26 O'Farrell Street, San Francisco 8, California.

ACCOUNTS WANTED: New England Sales Engineer selling metal manufacturing plants wants additional line. Specialize on parts or raw material items for production. Long established in territory, wide acquaintance among industrial buyers and engineers. RA-800, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SALES ENGINEER—Good entree in New York-North Jersey, desires high grade small tool line. Practical background, exclusive sales, commission. SA-824, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SELLING OPPORTUNITIES WANTED

SALES REPRESENTATIVE New England territory over twenty years experience this market, small tools, machine tools, or equipment to be sold direct or through mill supply jobbers to manufacturers and machine shops. For worthwhile connection would locate in other territory. SA-823, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PATENT ATTORNEY

PATENT and Trade-Mark Practice before U. S. Patent Office. Validity and Infringement Investigations and Opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine & Rommel, Registered Patent Attorneys, Suite 453, 815-15th Street, N. W., Washington 5, D. C.

LINES WANTED

Sales and Service Engineer with 20 years practical and theoretical experience on West Coast in cutting tools, wants to add high grade lines of machine shop products to represent as manufacturer's agent in Pacific Northwest.

RA-814, AMERICAN MACHINIST
68 POST STREET, SAN FRANCISCO 4, CALIF.

AVAILABLE ESTABLISHED BUSINESS INCORPORATED 35 YEARS

Present Manager-Owner-Founder—Retiring small machine tool special product with minimum competition—substantial shop building, ample land in rural Rhode Island. Complete going business. Land—Building—Machinery etc.

BO-816, AMERICAN MACHINIST
330 West 42nd St., New York 18, N. Y.

AVAILABLE
Established Business

Because owner wishes to retire, we offer an established business which has for years sold Machine Tools, Foundry and Heat Treating equipment in Texas and Louisiana. Business as now operated has returned an excellent income and anyone who is now selling or who is familiar with the small tool or supply field could immediately expand along this line. Business now in own establishment, which could be sold or leased to new owner.

BO-790, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

CHECK THIS!

PATENTS FOR SALE, or will grant exclusive license on royalty basis.

ROTARY RECTANGULAR MILLING TABLE.

ROTARY TABLE FOR BORING MILLS AND JIG BORERS.

Far in advance of any available now.

Full details upon application

BO-817, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

MODELS

Plant layout models made to specifications. Prototypes of any machine available in wood.

HOOSICK MODEL COMPANY
Petersburg **New York**

PETITT BROS. MACHINERY CO.

If You Want to Buy, Sell, or Trade One Machine or Entire Plant Consult Us Immediately

FRED. PETITT ALBERT PETITT
OFFICE AND WAREHOUSE

1240 WEST 4th ST. CHERRY 0609
CLEVELAND 13, OHIO

Auction and Equipment Wanted Advertising see page 314

EVERY ITEM GUARANTEED AS REPRESENTED

FALK FOR DEPENDABILITY IN REBUILT MACHINERY

AUTOMATICS

1—1¼" Cone 4-spindle Automatic, Motor Driven, Threading Spindle.
1—#515 National Acme 9/16" 4-spindle Automatics, complete
1—#1 Brown & Sharpe Standard Speed, Belt Drive, Full Automatic (same size as #2).
1—#2G Brown & Sharpe Full Automatic, serial #5396.
1—Brown & Sharpe #2 Full Automatic with vertical slide, serial #6868 with a Drive-All Drive

LATHES

Logan Q.C.G. Lathes (new).
Sebastian Engine Lathes (new).
1—LeBlond Heavy Pattern 24" x 12' 3-step cone Engine Lathe
13" x 6' Williard, geared head
14" x 6' Hendey Yoke Head
14" x 6' Rockford Cone drive (two)
14" x 20' Hendey Toolmakers Lathe.
16" x 6' American Motor Driven Lathe.
16" x 8' Lodge & Shipley 12-speed Grd. Hd.
18" x 6' Chard, M.D.
18" x 10' American, Geared Head, Taper.
18" x 222" Hendey, M.D. (two)
20" x 10' Hendey with Taper.
20" x 11' Schumacher-Boye, M.D.
24" x 20' American, Motor drive.
28" x 10' Davis cone driven
48" x 30' Simmons Geared Head, 1941.

TURRET LATHES

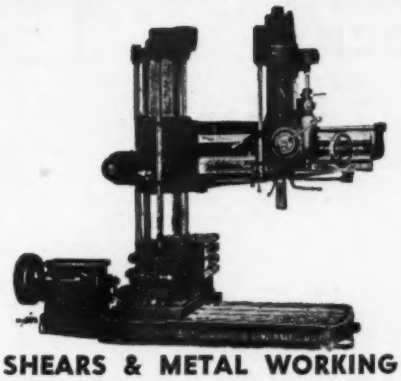
4—#4 Warner & Swasey Hand Screw Machines, arr. Motor Drive.
2—#4 Warner & Swasey Universal Turret Lathe, Motor Driven.
16" Warner & Swasey Brass Lathe.
#2A Warner & Swasey Universal.
#6A Potter & Johnson Automatic Chuckers.
#3R Gisholt Universal like new.
#4 Foster GFH Hand Turret Lathe.
3—Morey #2G Geared Head Turret Lathe, motor drive (late model)
2—Simmons #2 (microspeed) Turret Screw Machine (late model)
Bullard 42" Vertical Turret Lathe

TURRET PUNCHES

Hecker, vertical type, 8-station, air operated, 18" throat.

PLANERS

20" x 20" x 24" N.B.P., Planer Shaper.
26" x 26" x 8' Gray Planer, 2 heads.



SHEARS & METAL WORKING

Lennox Splitting Shear ¾" cap.; 8' throat.
Lennox Bevel Shear, ¾" cap.
Peckstow 30" x 18 ga. Squaring Shear.
Gould & Eberhardt Slitting Shear, 10 ga.
Niagara 48" Roller Leveller, 6 Rolls.

MILLING MACHINES

#3, #4, #5 Cinn. High Power, Plain, S.P.D.
#1-#1½-#2 Brown & Sharpe Plain Miller.
P & W 2½" Duplex Spline Miller.
Thread Miller, Hall Planetary #1—24".
#8 Lees Bradner Thread Miller.
#1, #2 Kempsmith Plain Millers.
#3B Hendey Universal Miller, motor drive.
#4 Cinn. Vertical High Power Miller. (2).

2—#16 Blanchard Surface Grinder, 30" dia., magnetic chuck, 25 h.p. motor on spindle.
2—#2 Cincinnati Centerless Grinder.
Pratt & Whitney Vertical Surface Grinder, 14" x 36" with 10" x 36" Magnetic Chuck. Ball Bearing Spindle. Perfect Condition.
#2 Cincinnati Universal Tool and Cutter.

RADIAL DRILLS

4' Arm, 11" Column Cincinnati-Bickford.
5' Arm, 13" Column Cincinnati-Bickford.
5' Arm, 14" Column Fosdick, motor drive.
6' Arm, 15" Column Cincinnati-Bickford.
3½', 10" Col., Cincinnati-Bickford AC Motor Drive, Gear Box.
1—Leland-Gifford 6-spdle. Drill Press (late model) ind. spdle. motors.
Cincinnati-Bickford 5' Arm, 13" round column with air clamp. Oil grooved, tee slotted base, side base, with plain box table with #5 Morse Taper spindle. Motor drive.

GRINDERS

Queen City Dble. End Grinders, motor driven (new).
#33 Abrasive Vertical Surface.
#3 Abrasive Horizontal Surface.
12" No. 22 Heald Rotary Surface Grinder.
16" Persons-Arter Rotary Surface Grinder.
1—Gardner Dble. Opposed Grinder #14
1—Seybold 96" Knife Grinder
Oliver of Adrian Drill Grinders
Cincinnati Centerless Grinders #2 M.D.
#12 Greenfield Internal Hydromatic Grinder, sizematic type, complete with Tank and Pump. 15" swing, 5" hole; 4" deep.
#2 Brown & Sharpe Surface Grinder.
#70 Heald Internal Grinder.
#60 Heald Cylinder Grinder.
10" x 18" Norton Cylindrical.
2—Cincinnati, #1½ Tool & Cutter Grinders.

BORING MILLS

72" Cincinnati Heavy Pattern Vertical Boring and Turning Mill.
3½" Bar Landis-Rochester Horizontal Boring Mill, Model #36.
#31 Lucas Horizontal Boring Mill, 3" bar.

DRILLING MACHINES

Avey, 2 & 3 spindle Prentice, 4 spindle.
Henry & Wright, 6 spindle, #2 M. T.
Fosdick 13" Super speed 4-spindle drills.
Natco #12, 12 spindle #1 M. T.
2—Natco #14, 22 spindle Rectangular head Drilling Machine, #2 M. T.

POWER PRESS HEADQUARTERS

Famco Arbor & Foot Presses (new).
#4 Bliss D. C. Forging Press.
200 ton A.C.F. Hydraulic Press. Bed. 24" x 36", 4-post.
75 ton H.P.M. 2 post, Hydraulic Press.
Hilles & Jones #4 Single End Punch and Shear. Equipped as Plate Shear with 18" Blades. ARR, motor drive, 54" throat.

SHAPERS & GEAR CUTTERS

1—Whipp 16" B. G. Crank Shaper.
1—Fellows #6—36" Gear Shaper.
Barber-Colman Gear Hobbers #2, #3.
1—Brown & Sharpe #3—26" Automatic Gear Cutter.
#1 Adams Gear Hobbers, Belt driven (2).
24" American Direct Motor Drive.
Slotter 12" stroke New Haven, motor drive.

FOUNDRY MOULDING MACHINES

2—#0 Jolt Squeezer Draw Pattern serial #58382197, #58382196
2—#42 Osborn Rockover and Draw Machines, 14" x 20½" table
3—#342 Osborn Jolt Rollover Pattern Draw Moulding Machines
2—Hand Rollover Power Draw Moulding machines complete with Run-out cars

MISCELLANEOUS

15 KVA Ace Spot Welder, 18" throat, 1/60/440 volt.

Approved Dealer War Assets N. Y. 47

BUY FROM STOCK
Telephone
MAIN 6347-6348

FALK MACHINERY COMPANY

Machinery Merchants

18 WARD ST.
ROCHESTER 5
N. Y.

QUALITY *Machine Tools*

NOW IN STOCK

No. 5 Warner & Swasey Universal Turret Lathe, with Pre-Selector, Timken bearing spindle, motor and control. New in 1943.

Model D Barber-Colman Hydraulic Gear Hobbing Machine, motor driven. New in 1943.

AUTOMATICS

5¼" Cleveland Model A, single spindle.
16" x 33" Fay Automatic Lathe.
⅞" Cleveland Model M, four spindle.

BORING MILL

No. 31 Lucas, motor driven.

DRILLS

★ **4 Ft. American Hole Wizard Radial Drill, motor on arm, new in 1940.**
No. D2 Colburn, single spindle.
42" Cincinnati Bickford.
Allen Sensitive Drill, four spindle.
★ **No. 3 Bausch Multiple, 20 Spindle, No. 2 Morse Taper, Rectang. Head 20" x 40".**
Pratt & Whitney Gun Barrel Drill.
LeBlond Gun Barrel Drill.

GEAR CUTTERS

No. 3 and Model A Barber-Colman Gear Hobbers.
No. 6, 61 Fellows Gear Shaper, m.d.
6" Gleason Str. Bevel Gear Generator.

GRINDERS

36" x 168" Mattison Surface Grinder.
No. 22 Heald Rotary Surface Grinder.
No. 16-26" Blanchard Surface Grinder.
No. 72A3 Heald Sizematic Int. Grinder.
No. 72A3 Heald Gagematic Int. Grinder.
10" x 24" Norton Cylindrical Grinder.
10" x 72" Norton Cylindrical Grinder.
10" x 24" Thompson Hyd. Surface Grind.
No. 2 & No. 3 Cinci. Centerless Grinder.
No. 35 Excello Thd. Grndr., new in 1943.

JIG BORING MACHINES

★ **No. 2A Pratt & Whitney, with 22" x 44" Table, 24" rotary table, locating device, inside micrometer, measuring rods, etc. New in 1944.**

LATHES, ENGINE

14" x 6' Sebastian, motor in base.
16"x6' Hendey, g.h.
20" x 12' Lodge & Shipley, g.h.
48" x 12' Lodge & Shipley, C.D.
No. 12 Gisholt Hyd. Lathe.
LR Lo-Swing Lathe, m.d., new in 1940.
15" x 30" Lipe Carbo-matic, new in 1943.

LATHES, TURRET

No. 3A Warner & Swasey, g.h.
No. 2A Warner & Swasey, Timken Bearing, new 1942.
No. 1A Warner & Swasey, g.h., new 1943.
No. 1B Foster, g.h.
No. 4 Warner & Swasey, g.h., new in 1942.
No. 3 Warner & Swasey, g.h., new in 1943.
No. 1 Bardons & Oliver, c.d.
No. 1 Brown & Sharpe, m.d.
No. 6D Potter & Johnston Automatic Chucking and Turning Machine.

MILLS

No. 31 Lucas Horizontal Bor'g Mill, m.d.
No. 36 Van Norman Horizontal, m.d.
No. 4A Brown & Sharpe Universal, s.p.d.
No. 3 Cincinnati Universal, s.p.d.
No. 4 Cin. Plain, Rect. Overarm.
No. 2H Milwaukee Plain double overarm, motor in base.
No. 2-MH Cincinnati Plain, m.d.
★ **No. 4H Milwaukee, Double Overarm, motor in base, new 1940.**
No. 2H Milwaukee Vert., motor in base.
No. 2209 Milwaukee, Table 22" x 158".
No. 3-36 Cinci. Hydromatic Duplex, m.d.
No. 6 Whitney Hand Mill.

MISCELLANEOUS

No. 17 Greenerd Arbor Press.
No. 100 Micromatic Hydrohoner.
8" x 7" Troy Vertical Steam Engine.

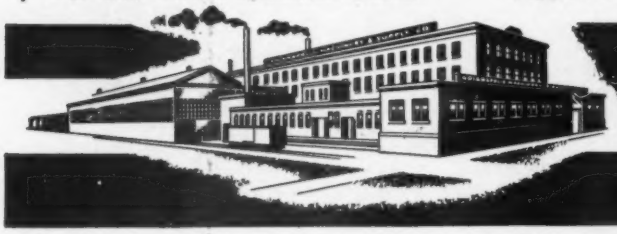
PLANERS AND SHAPERS

★ **12" Hendey Crank Shaper, motor driven, 16" Ohio Crank Shaper, c.d.**
28" Gould & Eberhardt Crank Shaper.
★ **6" Pratt & Whitney Vertical Shaper.**
42" x 42" x 20' Cin. Planer, D.C. Rev. m.d.

SAW

9" x 9" Peerless, Hydraulic.

(Approved Dealer for War Assets Administration Surplus Machines)



INDIANAPOLIS MACHINERY & SUPPLY CO., INC.

1961 S. Meridian St., Indianapolis 6, Indiana

EASTERN BRANCH: 44 WHITEHALL ST., NEW YORK

MEXICO OFFICE: *Avenida Independencia No. 36B, MEXICO, D. F.*

POWER PRESSES

BLISS 304—58 ton, 8" stroke, 18"x18" bed
BLISS 4½—75 ton, single and double act. 1½-4½" stroke, 21"x31" Bed
BLISS 6—125 ton single and double act. 2-5" stroke, 24"x31" Bed
BLISS 7—180 ton, single and double act. 1½-4½" stroke, 24"x36" Bed
BLISS 7—88 ton, 4-8" stroke, Horizontal Horning
BLISS Hydro-Dynamic 100, 150, 200 ton adj. stroke, 30"x31" Bed
BLISS 88—226 ton, 10-30" stroke
BLISS 25A—600 ton knuckle
BLISS 26A—800 ton knuckle
BLISS 27—1000 ton knuckle
CLEVE 14S—180 ton, 8-30" stroke
CLEVE 8K—800 ton knuckle, 6" stroke
CLEARING K 1800—42, 800 ton knuckle 6" stroke
TOLEDO 59½S—504 ton, 8" stroke 31"x 31" bed, twin dr.
W & F 6600-6" stroke, 10 sta. trans. slide, 3"x15" Bed

Ceco Stamps—24x48, 36x48, 48x48, 60x156
Pneumatic Drop Hammer 36x48 3000# Head
Hydraulic Presses 75 ton to 5000 ton
100,000# Draw Bench for 40 ft. tube, single, double, triple heads

GOTHAM MACHINERY CORPORATION

1775 BROADWAY PLaza 9-4643 NEW YORK 19, N. Y.

National Bent Shank Nut Tappers—Battery of ⅝" and ⅞" Machines.
2 Landis ¾" Bolt Formers and Threaders, M.D.
1 National ½" to 1" Hot Bolt Head Trimmer
Woodward & Powell 42" x 42" x 36 ft. 4 Head Planer
Cincinnati 36" x 36" x 16 ft. Planer, M.D.
1 Lodge & Shipley 36" Swing by 44 ft. Bed, Selective Geared Q.C. Lathe, M.D.

National Machinery Exchange

128-138 Mott St., New York 13, N. Y.

OTT MACHINERY SPECIALS

AUTOMATICS, Acme-Gridley 6 spdle, 9/16" & 2⅝"
AUTOMATICS, Gridley, 9/16" & ⅞" Model G
AUTOMATICS, #11 Polymatic Form & Cutoff
AUTOMATICS #1 Wickman Swiss Type, used very little
CONOMATICS, 2⅝—8 spindle, M.D.
GRINDER, Norton 10"x36" Hydraulic, M.D.
LATHES, Hendey, E.B.M. type, 14"x7' M.D.
LATHES, Rockford, 16"x8' Geared Head, M.D.
MILLING MACHINES, Milwaukee #1B Universal #2, Plain, M.D.
NIBBLERS, Savage & Campbell
PRESS, DDG54 Ferracute, D.A.
THREAD ROLLER, Watson-Flagg. Late type—3/16" to 2⅛" cap.

OTT MACHINERY SALES, INC.
542 Second Avenue
Detroit 26, Mich.
CADILLAC 3103

MDNA

FOR SALE

10' Niles Vertical Boring Mill
80" dia. Table—Vee Drive
CANAL MACHINERY
176 Lafayette St., New York, N. Y.

ENGINE LATHE

48"x22' Niles-Bement-Pond Geared Head Motor Drive—Purchased new 1941—Very Attractive Price Before Removal.

SUN MACHINERY COMPANY
36 Van Vechten St., Newark 5, N. J.

DRILL, RADIAL—FOSDICK 3½". G.B., M.D.
KEYSEATER—MITTS & MERRILL No. 6, M.D.
MILLER, PLAIN—MILWAUKEE No. 2-B Double Over-arm, M.D.
PLANER, METAL—WOODWARD & POWELL 30"x30"x8' 1 rail head, 1 side head
TURRET LATHES—FOSTER No. 1-B Univ. Inc. 2 Wrenchless Chucks, etc. M.D.; also W & S No. 2-A Univ.
Available immediately—Also Many Other Tools
ALEX ZEEVE & COMPANY
2269 Woolworth Bldg. New York 7, N. Y.

LATEST TYPE NEARLY NEW MACHINES

Available for Prompt Shipment

Nearly All Built After 1941

AUTOMATIC SCREW MACHINES

BROWN & SHARPE #4 Latest type
CLEVELAND ⅞" to 2½" Model A
CONOMATIC 3½" 4 spindle—latest type
NATIONAL ACME 9/16" mod. C, 5 spdle., M.D.

BORING MILLS—Horizontal

FRANKLIN 4½" bar, single pulley drive
GIDDINGS & LEWIS #25, 2⅝" bar, M.D.
LUCAS #31—3" bar—motor drive
LUCAS #32—3¾" Bar Motor Drive
NILES BEMENT POND 5½" bar—M.D.
NILES-BEMENT-POND 5", 6", 7" bar—floor type—M.D.
OHIO #5F-420 5" bar Floor type, latest type
P & H #10—3½" bar—floor type—M.D.
PETRICK 3½" bar, floor type, M.D.

BORING MILLS—Vertical

BETTS 120"—2 swivel heads, motor drive
BULLARD 24", 36", 42" New Era Type M.D.
BULLARD 86"—2 swivel heads—motor drive
COLBURN 72" 2 swivel heads, AC, M.D.
KING 30" Vert., M.D.
KING 62" 2 swivel heads, PRT, AC, M.D.
NILES 42"—2 swivel heads; power rapid traverse
NILES 73"; 2 swivel heads; AC; M.D.
NILES BEMENT POND—100" two swivel heads, PRT Motor Drive

DRILLS

BAKER #121 Single spindle—latest type
BARNES #H3, Hydram, latest type
BARNES #210—single spindle—LATEST
BAUSH #2, #3, Multiple spindle, M.D.
BODINE #42-20, 42-30 auto, M.D.
COLBURN #14, 2 spindle, heavy duty, AC, M.D.
EDLUND No. 1B, single spindle, M.D.
EDLUND No. 2MS, 2 spindle, M.D.
FOOTE BURT SIPP #2, #3—single spindle—latest
HENRY & WRIGHT 2 spindle
NATCO C-13H multiple spindle
PRATT & WHINEY No. ½Bx50" 2 spdle. Deep Hole—latest type

DRILLS—RADIAL

AMERICAN 3'11"—hole wizzard—LATEST
AMERICAN 4'11", 5'13" triple purpose, M.D.
AMERICAN 4'11", 5'11", 5'13" triple geared, AC M.D.
BICKFORD 4'11", 5'11", 5'13", AC., M.D.
CANEDY OTTO 3'11" New
CARLTON 6'17", latest type
CARLTON 4'13", 5'14", 6'15", M.D.
CINCINNATI BICKFORD 4'11", 5'13", plain, M.D.
CINCINNATI BICKFORD 6'19", Super Service, M.D. latest type
DRESES 4'13", 5'15", AC, M.D.
FOSDICK 5'14" AC, M.D.
MORRIS 3½'9", 4'11" AC, M.D.
MUELLER 4'11", 4½'9", AC, M.D.
NILES BEMENT POND 6'15" uni., AC, M.D.
REED PRENTICE 4', 6', AC, M.D.
RYERSON 4'11" AC, M.D.
WESTERN 3' single pulley drive
WESTERN 4'18"; 5'18"; 6'20"—latest type

GEAR CUTTING EQUIPMENT

BARBER COLMAN Type A Hobber—LATEST
BARBER COLMAN Type S hobber, latest type
BARBER COLMAN No. 3 Gear Hobber
BARBER COLMAN #12 hobber, M.D.
BROWN & SHARPE #3H gear cutter, M.D.
FELLOWS #7, #7A, 72, 77 gear shaper
FELLOWS #7125A, 75A, latest type
GLEASON #13 tester, M.D.
GLEASON 24" Bevel Gear Planer
GLEASON 18" bevel gear generator
GOULD & EBERHARDT 18H Uni. hobber, M.D.
G & E #96H Gear Hobber, with differential

GRINDERS—Cylindrical—Plain & Univ.

BROWN & SHARPE #5 Plain 3x12 latest type
BROWN & SHARPE #1, #2, #3, #4 Univ.
CINCINNATI 12x36—Univ. Hyd.—LATEST
LANDIS 6x20 6x18 Plain—motor drive
LANDIS 6x30 Plain Type "C", Hyd. latest
NORTON 10x18 plain, M.D.
NORTON 14x48 Univ. Type C Multi-purpose HYD., latest type
NORTON 16x72 Plain, Type C, Latest Type

GRINDERS—Internal, Cutter and Misc.

BROWN & SHARPE #13, Uni., and tool, M.D.
BROWN & SHARPE #10 Tool & Cutter—LATEST
BRYANT No. 16—16" Chucking—Internal—latest
BRYANT #5 internal, hyd., latest type
FITCHBURG Uni. spline shaft, hyd.
GLEASON #12 cutter grinder
HEALD 72A3 Sizematic internal, latest type
HEALD 72A5 Plain internal dial type, latest type
LEBLOND #2 uni., tool and cutter, latest type
NORTON 16x72 Plain, Type C—LATEST TYPE
PRATT & WHITNEY Contour Cutter—latest type
SELLERS #4T Univ. tool—latest type

GRINDERS—Surface

ABRASIVE #3 22x8x12, M.D.
ARTER, 8" Rotary Surface
ARTER 30" Rotary Surface—Hydraulic latest
ARTER Automatic Piston Ring
BLANCHARD #16A—Dial Type—meter drive
BLANCHARD #16—26" Chuck—motor drive
BLANCHARD #18—30" chuck—LATEST
MATTISON 12x16x48—Hyd.—LATEST
MATTISON 12x14x30—Hyd.—LATEST
MATTISON 12x14x60—Hyd.—LATEST
MATTISON 16x24x96—Hydraulic—latest type
NORTON 10x36—Hyd.—LATEST

LATHES—Engine & Mfg.

AMERICAN 42x17' Bed Motor Drive
BRIDGEFORD 36"x28', 36"x32', 36"x35', 42x35' bed—2 carriages
HARDINGE TR59—LATEST
HENDEY—12x54 centers—Mfg.—latest type
LEBLOND—13"x4' bed—Timken—Mfg. latest
LEBLOND 17"x14' bed, Mfg., Timken—latest
LEBLOND 20"x48', centers—Timken Mfg., latest
LOSWING 4x34, 4x60, 8x34, 8x108, 8x60—Timken Bearing—latest type
LOSWING 10x34 Model LR Auto., Timken, latest
MONARCH 12x30" centers—Timken—LATEST
NILES 36"x25 centers, 2 carriages; PRT; Timken Bearing, latest type
PITTSBURGH 50'x30' bed—M.D.
PRATT & WHITNEY—12-30" Centers—Timken—LATEST
RIVETT #918—LATEST

LATHES—Turret

BARDONS & OLIVER #3 latest type
BARDONS & OLIVER No. 5, No. 7 Univ., Timken Bearing, chucking; latest type
CINCINNATI ACME #5W—Timken Bearing—latest type—2" Bar Cap.
CINCINNATI ACME #1 Uni.—Timken—latest
GISHOLT #3, #4 Univ. Timken Bearing—latest
GISHOLT #3D Simplimatics—Timken—latest
GISHOLT #4L, 9" hole—cross sliding Turret—Timken Bearing—latest type
GISHOLT #1L, #2L, uni. Timken bearing, latest
JONES & LAMSON #3, #5, #7C Univ.; latest type—Timken Bearing
LIBBY #1H-5 Timken Bearing—latest 5½" hole
MOREY #2C, 1" cap.—Timken Bearing
MOREY #3 Univ. 1½" Cap.—Timken Bearing
MOREY #4 Univ. 2 cap., Timken Bearing
WARNER & SWASEY #3, #4, #5, Univ., Timken Bearing—latest type
WARNER & SWASEY No. 1A, 4A, Univ., Timken M.D.

MILLING MACHINES—Manufacturing

BRIGGS Type 2A Production, Hydraulic, latest type
BROWN & SHARPE #12 auto., Timken, latest
CINCINNATI 4-36 Hydro, Timken Bearing—latest
CINCINNATI #08 Vert.—Pl. Auto.—Timken Bearing—latest type—Rise & Fall
CINCINNATI #1-12, #1-18 Plain Auto.—Timken Bearing—latest type
CINCINNATI 48" duplex, automatic, SPD
KEARNEY & TRECKER #1218 Auto.—Timken Bearing—latest type
MOREY #12M 2 spdle Profiler & Milling Machine
NICHOLS hand, M.D.—latest type
OHIO Auto. 16"x72" table—Timken Bearing—latest type—36" longitudinal feed

MILLING MACHINES—Plain

CINCINNATI #4S High power, motor in base
CINCINNATI #5 high powered, M.D.
KEARNEY & TRECKER #3K, Timken, latest
KEMPSMITH #4 Maximiller—Timken latest

MILLING MACHINES—Universal

AMES Bench, Timken Bearing, latest type, M.D. 1" collet.
BROWN & SHARPE #3A Timken Bearing—dual control—latest type
ROCKFORD #2B—moterized
VAN NORMAN 22L—LATEST TYPE

MILLING MACHINES—Vertical

BROWN & SHARPE #5—motor drive
CINCINNATI #2, #4—Dial Type—Timken Bearing—latest type
COCHRANE BLY Uni. Vert. Shaper-Miller; M.D.
KEARNEY & TRECKER #3K, Timken, latest

PLANERS

BELMAR 36x36x10' 2 heads, AC, M.D.
BELMAR 48x48x12' 3 heads, AC, M. D.
BICKETT 36x36x12' 3 heads, AC, M.D.
CHANDLER 36x36x20', 4 heads, AC, M.D.
CINCINNATI 24" rank—motor drive
CINCINNATI 36x36x5' Box Table, PRT, 1 head—motor drive
CINCINNATI 48x48x20' 3 heads, AC, M.D.
CINCINNATI 120x96x20'—4 heads, box table—PRT motor drive
CINCINNATI 36x36x8', 2 heads, AC, M.D.
CINCINNATI 42x36x12', 2 heads, AC, M.D.
CINCINNATI 60x48x14' 4 heads, AC, M.D.
CLEVELAND 48x48x16' Opensides 3 heads, M.D.
DETRICK & HARVEY 48x48x10', 12' open side, 3 heads, M.D.
DETRIK & HARVEY 48x48x16' 4 heads, Hyd., M.D.
GRAY 44x36x12', 4 heads, AC, M.D.
GRAY 48x48x14', 4 heads, AC, M.D.
GRAY 54x42x10', 2 heads, AC, M.D.
GRAY 60x48x16', 3 heads, AC, M.D.
HAMILTON 42x42x20', 4 heads, motor drive
HAMILTON 48x48x16', 4 heads, DC, M.D.
LIBERTY 36x36x9', 3 heads, AC, M.D.
LYND FARQUHAR 26" Openside, motor drive
NBP 36x36x10', 3 heads, DC, M.D.
NBP 42x42x12', 2 heads, AC, M.D.
NBP 48x48x14', 10', 2-4 heads, AC, M.D.
NBP 54x54x12', 2 heads, box table, AC, M.D.
NILES 48x48x12' Time Saver, 3 heads, power rapid traverse, box table, DC, M.D., latest type
NILES BEMENT POND 96x80x20' box table 4 heads Hyd. PRT—motor drive
OHIO 36x36x10', 2 heads, AC, M.D.
OHIO 42"x42"x20', 2 heads, AC, M.D.
PATCH 48x48x14', 4 heads, DC, M.D.
POND 42x42x12', 2 heads, AC, M.D.
POND 48x48x16', 2 heads, AC, M.D.
PUTNAM 48x48x18', 4 heads, AC, M.D.
WOODWARD & POWELL 36x36x12', 4 heads, AC, M.D.
WOODWARD & POWELL 42x42x10', 4 heads, AC, M.D.
WOODWARD & POWELL 84x48x18', 2 heads, AC, M.D.

SAWS

BRIDGEPORT #48W Abrasive
CAMPBELL No. 213 Wet Abrasive Cutoff, latest
CAMPBELL #401 Cutamatic Wet Abrasive—latest
GROB #08-20 band, latest type
LUCAS #138 cold saw, motor driven
MAQUOKETA 10x10 hack, M.D.
MARVEL #9, 10x10 Hack; latest type
MOTCH & MERRYWEATHER #3 Cold Saw—Hyd.—latest type
PEERLESS 14x14 Hack; latest type
PEERLESS 10x10 Hack—LATEST

SHAPERS

BETTS 18" vert. slotter, DC, M.D.
CINCINNATI 28" horiz. double head
COCHRANE BLY Uni. Vert. Shaper-Miller; M.D.
JONES 6" Vertical—latest type
LAMAIRE 18" Vert. Hydraulic—latest type
MOREY 10", 14" Vertical—latest type
NEWTON 15" vert. slotter, DC, M.D.
NILES 18" vert. slotter, DC, M.D.
PRATT & WHITNEY 6", 10" Vertical Motor drive
ROCKFORD 24" Hyd.—LATEST

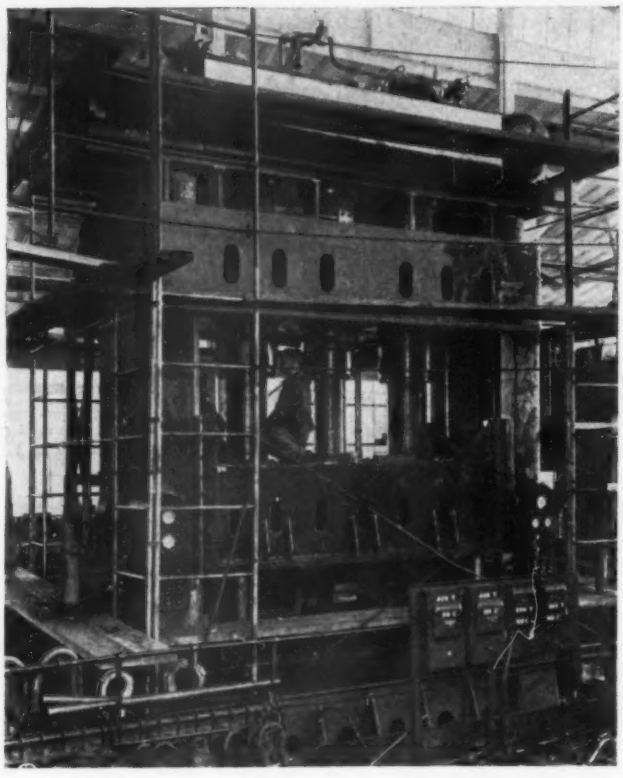
THREAD MILLING MACHINES

MOREY SHIELDS 12x120, 12x192—latest type
PRATT & WHITNEY 4½x12, 6x20, Model C—latest
PRATT & WHITNEY 6x132—motor drive

MISCELLANEOUS

BARNES #2 SS Hone—latest type
BAUSH Radial Tapper—LATEST
BILLINGS & SPENCER 200, 400, 800 lbs. Board drop hammer
COLONIAL Model HAS-25-72 Universal, Broach, horizontal, hyd., 25 ton cap.
FERRACUTE No. DG-55 Drawing—latest type
FISHER #1 Oil Groover, M.D.
LANDIS ¾" Bolt Threader—LATEST
LEBLOND #2 Horiz. Hone—SS
LEBLOND #2 Deep Hole Borer; latest type
MORTON 60" Combination Traveling head Planer, Milling & Drilling
NILES 30"x50' Deep Hole Borer, Timken latest
PRATT & WHITNEY 3B Jig Borer, Latest type
WHITON 8x108 Duplex Centering, M.D.
YODER Mult. Tube Cutting Machine

MOREY MACHINERY CO., INC.
410 BROOME ST., NEW YORK 13, N. Y.
TELEPHONE: CANAL 6-5360
CABLE ADDRESS: WOODWORK, N. Y.



HYDRAULIC PRESSES

One brand new 1000 ton Lake Erie single action hydraulic press with cushion in bed and 220 V. 60 cy. 3 ph. electrical equipment. Between housings 140", bed size 60" x 144", capacity of cushion ram 140 tons, stroke of main ram 36", stroke of cushion ram 24". Shut height above bolster 36". Hole thrubed 40" x 132¼", shut height above bolster 36". Speed of operation 1250" per minute, rapid traverse closing, 295" per minute, low pressure pressing up to 300 tons, 87.5" per minute high pressure pressing at 1000 tons, 1050" per minute rapid tranverse return. *Delivery in the month of November.*

1—500 ton Southwark single acting high speed hydraulic press, bed 42" F to B, by 54" R to L. Distance between uprights 54". Stroke 20". Shut height bed to ram 24". Hole in bed 26" F to B by 40" R to L with 75 HP 220 or 440 V. 60 cy. 3 ph. motor. *Delivery immediate.*

MILES MACHINERY CO.
SAGINAW, MICHIGAN

UNUSUAL VALUES

Blueprint machines, printer-washer-dryer
Rivett Ball Brg. Precision Screw-Machine
Simmons No. 1A Micro Milling Machine
Drills, high speed single & multiple spindle
Drill, 21" Royersford Bk. Grd. Pr. Feed, New
Drills, sensitive, 2 and 4 Spindle
Drill, #25 Foot-Burt, motor driven
Drills—New—18" Royal Motor driven (10)
Gear cutter, Brown & Sharpe #3—26
Gear cutter, Gould & Eberhardt 42"
Grinder, Webster and Perks #1-¾ motor drive
22" Buffalo Pr. Fd. Motor Drive, New
16"x8' Hendey Lathe, Quick Change Gear
Magic Chucks #1-2 & 3 and Collets
Pipe Machine, 3" Oster motor drive
Planer 24"x24"x6' Pease, motor drive
Punch & Shear, two ½" & ¾" capacity
Shaper, 24" Gould & Eberhardt
Turret Lathe, 2" Acme & Warner & Swasey
Welders—Arc & Spot in Stock—New

Outfit: about 27 fine machine tools, drills, lathe, and 5 milling machines, plain and Uni. Tell us definitely what you want as our list is incomplete and only partial.

The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

THE OSBORNE & SEXTON MACHINERY CO.
COLUMBUS, OHIO

McDONALD
USED MACHINERY

G & E 24" Cin. 32" Shapers
Cleveland O.S. Planer 36"x8', 2 hds.
Abrasive #3-B M.D. Horiz. Surf. Grinder
Cincinnati D. H. Planer 36"x36"x10', 2 hds.
Barnes geared Camelback Drill Press, 4 sp.
Bullard Vert. Turret Lathes, 24" & 36" S. Head
Defiance 3" Horiz. Boring Mill & Univ. #3-A
L & S 18x12' & 20'x10' 20"x8' Grd. Hd. M.D. & 28"x12' Lathes
American 24'x12 grd. hd. lathe, m.d. q.c.g.
Amer. 4-ton vert. Hydr. Broach
Blanchard Vert. Surf. Grinder, 26 rd. chuck.
Cincinnati #2 Centerless Grinder.
Colburn 60" & 72" Vert. Boring Mills
Cincinnati 1-M grd. hd., Univ. tool room Miller.
Cincinnati No. 5 H.P. grd. hd. S.P.D. Pl. Miller.
Milwaukee No. 3-B Vert. Miller grd. hd., m.d.
Cin-Bick 3' Super Serv. Radial
Gisholt 3R Grd. Hd. M.D. Turret Lathe
W.&S. No. 2A grd. hd. Univ. Turret Lathe, S.P.D.
Foster No. 2F Fostermatic grd. hd. Turret Lathe, M.D.

MDNA MEMBER

McDONALD MACHINERY CO.
1531-35 N. B'way., St. Louis 6, Mo.

AUTOMATICS

Gridley, 2⅝" Model RA., 4-spdl., motor 3/60.
Cone, 1⅞" Plain Bearing, 8-spdls., MD. (2)
Gridley, 1¼" Model C., 4-spdl. with motor.

LATHE

9" Hendey Gaugemaker's motor in base, TA., Oil Pan, Cabinet Base, Dial Speed Control, Collets, Bar Attachment & Chuck.

MILLING MACHINES

Van Norman #2-SU. Universal with 5 HP. Motor of 3/60/220 V. New 1940. (2).

GALBREATH MACHINERY CO.
Empire Building Pittsburgh, Pa.

King 30" and 52" Boring Mills, M.D.
No. 3 Abrasive Surface Grinder
No. 0 Waterbury - Farrell Screw Slotter

MDNA MEMBER

D. E. DONY MACHINERY CO.
47 Laurelton Road, Rochester 9, N. Y.

THREAD GAGES—PLUG AND RING

Slightly used. NF-2 & 3, ¼ to 1", 6, 8, 10 M.S. Also 1 to 4" N.S.

LESS 75 Percent Discount.

ADJUSTABLE SNAP GAGES. ALL SIZES. ½ to 8".

LESS 75 Percent Discount.

DE WITT TOOL COMPANY
173 GRAND STREET NEW YORK 13, N. Y.
Send For Our Bargain Circular

Bolt Cutters 1"-1½"-2"-2½" Acme Landis
Boring Mills, 36"-42"-52"-72"-96"
Drills, Radial 6' Cin. Bick., 5' Carlton.
Lathe, Turret 3-A W. & S. S.P.D.
Millers, Plain No. 3 K & T. No. 4 Cin.
Planer, 36"x36"x12' Powell 4 Hds.
Profiler, #13 P. & W., B.D.
Shapers, 16"-20"-24"-36"
Shaper, 36" Morton Draw Cut

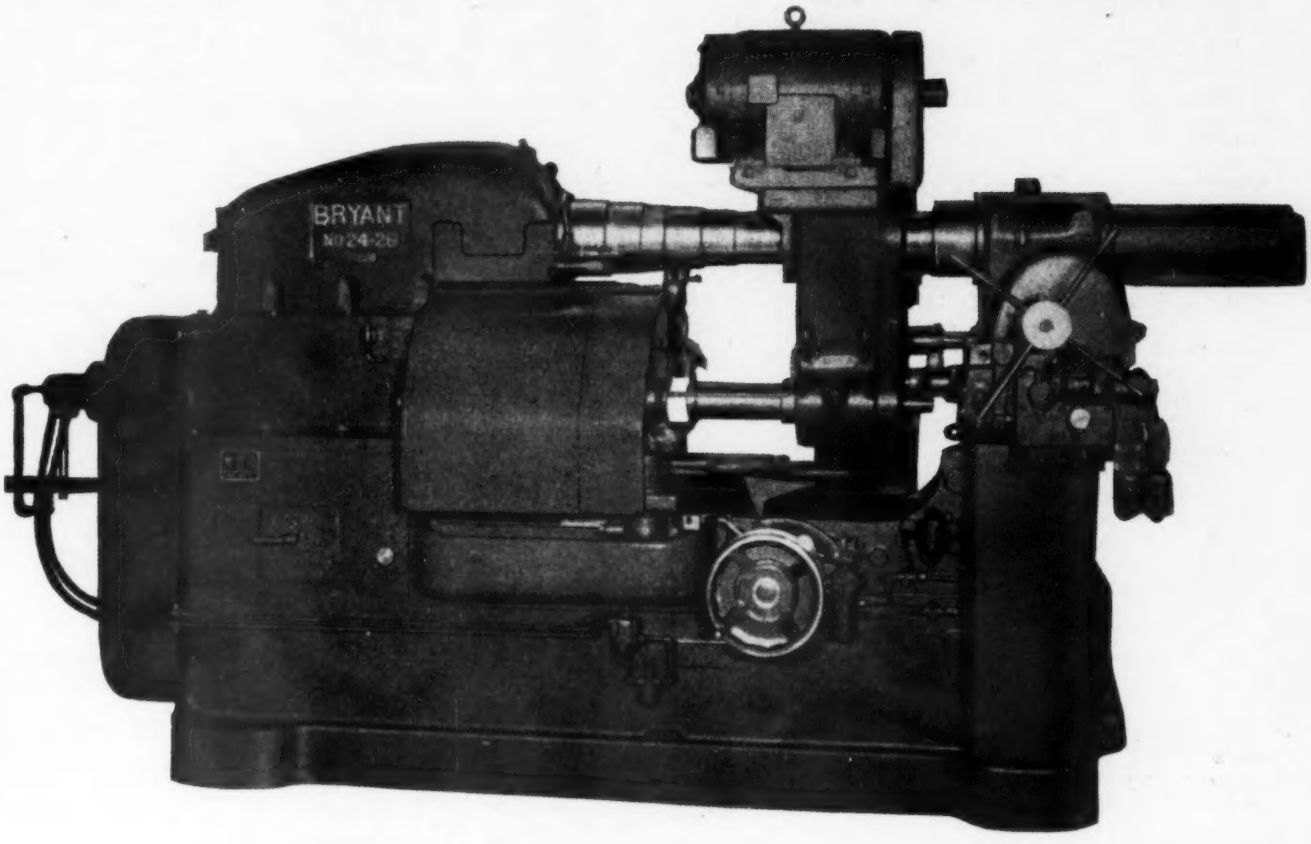
West Penn Machinery Company
1219 House Bldg. Pittsburgh, Pa.

LARGE LATHE

84"x52' Putnam Geared Head Motor Drive —Equipped with 2 carriages—Inspection in Operation.

SUN MACHINERY COMPANY
36 Van Vechten St., Newark 5, N. J.

NOW YOU CAN AFFORD A BRYANT HYDRAULIC GRINDER



24-26" BRYANT HYDRAULIC INTERNAL GRINDER

(slightly used)

Extremely massive construction. Built to take heavy cuts with accuracy and smoothness. SINGLE LEVER CONTROL. HYDRAULIC. Nothing else to buy. These machines—in stock now—have all 3 motors and electrical equipment, hydraulic pumps, coolant pump and tank and other extras. Ready to go *NOW!*

Are your jobs similar to these:

Crankshaft parts, propeller hubs, boxes, engine crank cases, aircraft parts, engine cylinders. Standard chucks work holding fixtures and attachments can be used on these machines.

Specifications

Swing—26". Max. traverse—19". Max. grinding length—16". 3 motors. *Additional specifications on request.*

EMERMAN MACHINERY CORP.

875 W. 120TH STREET CHICAGO 43, ILLINOIS

POWER PRESSES

AIR HYDRAULICS—2½ TON CAP. NEW.

	Make	Tons	Die Space	Stroke	Shut	Type
(20)	V & O #0	5	13"x 12"	2½"	7"	OBI Dial Feed
(20)	V & O #2	17	12"x 18"	2½"	11"	OBI Dial Feed
(22)	Hercules #32 (about)	15	10"x14½"	3"		"C" FrameHopper Feed
(23)	Wat Farrel (about)	15	12"x 18"	3"		"C" Frame Dial Feed
	Bliss #172A	22	5"x 4"	1½"	7"	End Wheel
	Bliss #20	30	14"x 22"	3"	8"	OBI
	Bliss #68C	35	21"x10½"	1-2½"	7"	Arch-DA
(3)	Mystic #5A	40	14"x 17"	6"	14"	Embossing & Moulding for Plastics
	Adriance #155	40	29"x 38"	1½"	10"	OBI-SA
	Torrington	40	23"x 16"	1-2"	6¼"	SS-DA
	Bliss #1B	43	14"x 26"	3-8"	8½"	SS-DA, Gap
(2)	Bliss #52	45	14"x 15"	2"	9½"	SS-DA
(2)	Consolidated #54	60	18"x 18"	3"	12"	Trimmers-Shear
	Bliss #57	75	18"x 18"	2"	11"	SS Trimming
	Bliss #4½	75	21"x 26"	1½-4½"	18"	SS-DA, Geared
(2)	Bliss #7	180	28"x 36"	1½-4½"	15"	SS-DA, Geared, Air Clutch
	Toledo #59½s	500	31"x 31"	8"	29"	SS-DA, Twin drive
	Lake Erie Hydraulic	2500	133"x120"	36"	42"	PBX Pump & Motor 1944

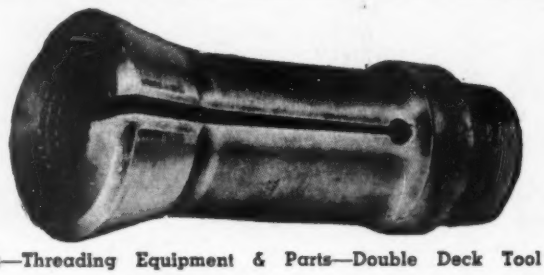
BRAKES—Press, Geo. Ohl. 10½'x10 Gauge, motorized D&K, apron type, 8'x16 g. power
GRINDERS—Centerless, Zephyr #2M (1945)
Crankshaft, Lempco 22"x108" (1944)
HAMMERS—Board Drop, Billings & Spencer, 1400 lb.
Board Drop, Billings & Spencer, 1600 lbs.
JIG BORER—Sip, Swiss MP 3C—like new
LATHES—Engine Le Blond 21"x10' Q.C.
(2) Engine Monarch 16"x8' motor in base taper
Oliver 18"x6' Q.C., motorized
RIVET COUNTERSINKING MILL—Farnham 36" reach
SAWS—Kalamazoo metal cutting, new
SHEARS—Power, Bliss 42"x11 g. Bliss 24"x3/16
Niagara 6'x10 g. Pexto 8'x16 g.
(8) TURRETS—Denver 6" motor in base air chuck, late
WELDERS—Spot—Ace 30 KVA 36" reach
Spot—Ames 5 KVA 12" reach
Arc—Hobarts 150-300 Amp.
Arc—Lincoln 150 Amps.
Arc—Wilson 200 Amps.

KINGS COUNTY MACHINERY EXCHANGE

394 ATLANTIC AVENUE, BROOKLYN, N. Y.
Phones: TRiangle 5-5237, 5-5213, 5-5212
WIRE — PHONE — WRITE

MONA MEMBER

LARGE STOCK OF NEW & USED COLLETS



Also—Feed Fingers—Pads—Threading Equipment & Parts—Double Deck Tool Holders—Cams.
R. A. 6 Gridley Automatics—1¼", 1⅜", 1⅝", 2⅝".
Mod. 60 & 61 New Britain—Namco Die Heads.
Collets for Gridley Model F, ¾", ⅞", 1¼", 1⅜", 1¾", 2¼, 2⅝", Automatic Mach.
Extra large stock of 2⅝" R.A. 6 Gridley parts and collets.
We have a large stock of used collets and parts for Acme, 52, 53, 55 & 56, Acme Gridley, Cleveland, Cone, Foster, No. 4 and No. 6 Warner & Swasey, Bardons & Oliver, Brown & Sharpe, Garvin and New Britains.

GRAFF MACHINE TOOL COMPANY
7139 So. Halsted Street *Vincennes 9664* **Chicago 21, Ill.**

MACHINE TOOL BARGAINS

HEALD No. 72 and No. 70A Internal Grinder
NORTHERN Heavy Duty 40" Precision Internal and External Grinders
NEWTON 4' Vertical Rotary Milling Machine
INGERSOLL 34"x48"x10' Double Housing Planer Type Milling Machine

All machinery in excellent condition and capable of holding new machine tolerances. May be inspected at our plant.

NORTHERN PUMP COMPANY
MINNEAPOLIS 13 MINNESOTA

NEW POWER PRESSES

Abrasive No. 1½ Surface Grinders, M.D.

Racine 6 x 6" Hacksaws, M.D.

AARON MACHINERY CO., INC.
45 CROSBY STREET NEW YORK, N. Y.

DRYING EQUIPMENT

Two banks Infra Red Drying Equipment 14'8" x 85" each. 256-250 watt lights 220 volt, 3 phase. Never uncrated.

A1 SHEETS

Five thousand pounds .025" x 48" x 144" 250 Aluminum sheets.

AUTOMATIC EQUIPMENT MANUFACTURING CO.
PENDER, NEBRASKA

NEW—USED **MACHINERY** and EQUIPMENT
LARGE STOCK ON HAND
Hasco MACHINERY COMPANY
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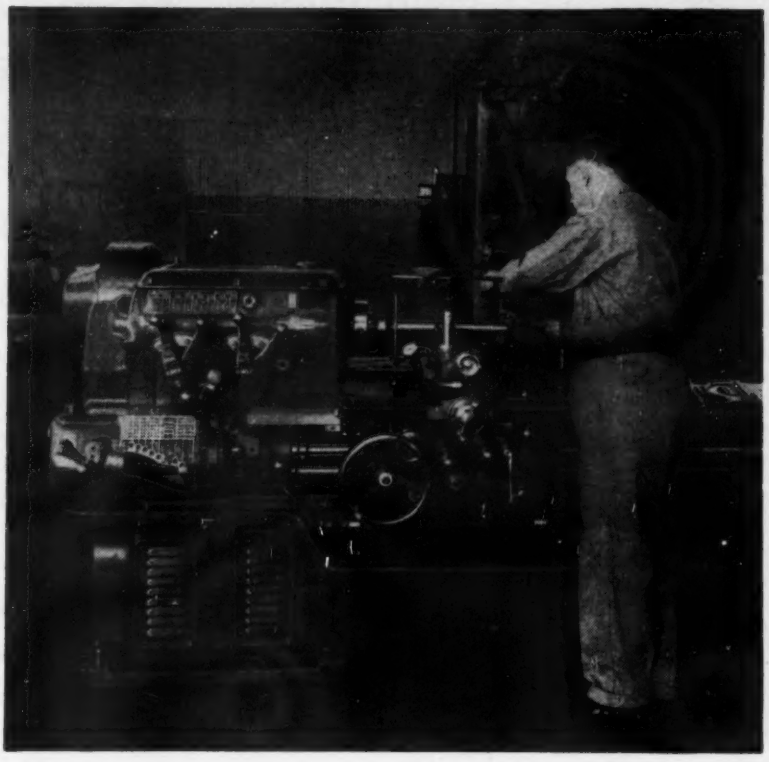
NEWARK 3, N. J. BIGELOW 3-3486-78

SHEET METAL MACHINERY

NEW and USED—Hand and Power Brakes, Shears, Forming Rolls, Folders, Punches, Rotary Machines, Stakes, Spot and Arc Welders.

MONA MEMBER **B. D. BROOKS, INC.**
361 Atlantic Ave., Boston, Mass.

IT TAKES EXPERIENCED MEN TO REBUILD MACHINES



YES, it takes men who know machines, all kinds, who have helped to build them when new . . . it takes completely equipped, modern plant facilities and management long experienced in the field of machine tools.

Eastern's long years of dealing with the same customers is proof of satisfaction delivered.

GEAR MACHINERY

Model T Barber-Colman Gear Hobber, m.d., latest
No. 12 Barber-Colman Double Overarm Gear Hobber, m.d.
No. 18H Gould & Eberhardt Gear Hobber, m.d.
No. 34 Brown & Sharpe Gear Hobber, m.d.
No. 44 Brown & Sharpe Gear Hobber, m.d.
No. 61 Fellows Gear Shaper, belt
No. 64S Fellows Gear Shaper, m.d.
No. 61A Fellows Gear Shaper, m.d., latest
No. 7A, 71A Fellows H.S. Gear Shapers, m.d.
3" Gleason Straight Bevel Gear Generator, m.d.
8" Gleason Mfg. Type Straight Bevel Gear Generator, m.d.
12" Gleason Straight Tooth Bevel Gear Generator, m.d.
9" Pratt & Whitney Hydraulic Spur Gear Grinder, m.d.
10" Pratt & Whitney Hydraulic Spur Gear Grinder, m.d.
No. 2HS Lees-Bradner Hydraulic Spur & Helical Gear Grinders, m.d.
11" Gleason Straight Tooth Bevel Gear Generator
No. 4—36" Brown & Sharpe Auto. Spur Gear Cutter
No. 6—60" Brown & Sharpe Auto. Spur Gear Cutter, m.d.
No. 13LS Fellows Gear Lapper, m.d.
No. 18 Fellows Gear Finishing Machine, m.d.
48" Cleveland Gear Hobber, m.d.
Cincinati Gear Burnisher, m.d.
Gleason Spiral Bevel Gear Rougher, s.p.d.
Schuchardt & Schutte Gear Tooth Rounder, belt

ENGINE LATHES

14"x6' American Geared Head, m.d.
13"x48" Pratt & Whitney Geared Head, m.d. in base, taper
14"x6' Hendey Geared Head, m.d., taper
14"x6' Pratt & Whitney, cone
14"x8' Pratt & Whitney, cone
16"x6' Bradford, cone, taper
16"x6' Hendey Geared Head, m.d. taper
16"x6' Lodge & Shipley Selective Head, m.d.
16"x6' Sebastian Type H Geared Head, m.d.
16"x10' Monarch Geared Head, m.d. in base, taper
18"x7' Hendey Geared Head, m.d., taper
18"x8' Hendey, m.d.
18"x8' American Geared Head, m.d., taper
18"x8' Lodge & Shipley, cone
18"x8' Lodge & Shipley Patent Head
20"x48" centers Pratt & Whitney Geared Head, m.d. in base, taper
20"x8' Springfield Geared Head, m.d., taper
23"x12' LeBlond Geared Head, m.d., taper
24"x72" centers Lodge & Shipley Selective Head, m.d., taper, latest
24"x10' American Geared Head, m.d.
24"x10' Hendey Geared Head, m.d.
25"x10' LeBlond, cone
26"x14' Bridgeford, cone, taper
27"x16' LeBlond, cone, taper
30"x12'6" Niles-Bement-Pond, m.d., taper
30"x13'6" Niles-Bement-Pond, m.d.
30"x26' Lodge & Shipley Selec. Head, m.d., 2 carriages
32"x16' Bridgeford Geared Head, m.d., taper
36"x12' Lodge & Shipley Selec. Head, m.d.
36"x21' centers Putnam Geared Head, m.d.
36"x28'6" Niles-Bement-Pond Geared Head, m.d.
36"x30' Lodge & Shipley Selec. Head, m.d., 2 carriages
36"x32' centers Putnam Geared Head, m.d.
36"x36'6" Niles-Bement-Pond Geared Head, m.d., 2 carriages

HORIZONTAL BORING MILLS

No. 0 Giddings & Lewis, m.d. 3⅛" bar
No. 21 Lucas, m.d., 2½" bar
No. 31 Lucas, m.d., 3" bar
No. 32 Giddings & Lewyis, m.d., 3⅛" bar
4" bar Detrick & Harvey Floor Type, m.d.
4" bar Landis Floor Type, m.d.
4" bar Niles, m.d.
4½" bar Niles, motorized
5½" bar Niles-Bement-Pond, m.d.
6" bar Niles-Bement-Pond Floor Type, m.d.
10" bar Sellers Floor Type, m.d.
Morton 60" stroke Horizontal Miller and Draw Cut Traveling Head Planer, m.d.

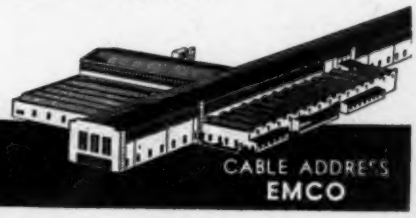
MANUFACTURING TYPE MILLING MACHINES

No. 3-36 Cincinnati Duplex Hydromatic, m.d.
No. 34-36 Cincinati Duplex Hydromatic, m.d., with tracer control, latest
No. 4-48 Cincinnati Plain Hydromatic, m.d., latest
No. 56-72 Cincinnati Plain Hydromatic, m.d.
No. CT-36 Lees-Bradner Thread, m.d., latest
No. CT-54 Lees-Bradner Thread, m.d., latest
Burr Mfg., m.d.
Hall Planetary Thread, m.d.
Becker-Lincoln Type, cone
24"x6' Ingersoll Slab, m.d.
36"x36"x14' Bement-Slab, m.d.
48" Cincinnati Automatic Duplex, m.d.
4½x12, 6x14" Pratt & Whitney Thread
6x20" type B Pratt & Whitney Thread, m.d.
6x48" Pratt & Whitney Thread, m.d.
6x80" Pratt & Whitney Therad, belted m.d.
18" Cincinnati Plain Automatic, m.d.
24" Cincinati Plain Automatic, m.d.
24" Cincinati Duplex Automatic, m.d.
28" Cincinati Automatic, s.p.d.
108"x72"x26' G. A. Gray Milling Planer, m.d.

MISCELLANEOUS

Gisholt Precision Balancing, m.d.
No. 2 Cochran-Bly Filing Machine, belt
Detrick & Harvey 2 spindle Profiler, belt
No. 12M Morey 2 spindle Profiler, m.d., latest
No. 12 Pratt & Whitney 2 spindle Profiler, belt
No. 11, 11S Cochran-Bly Saw Sharpeners
Wagner Saw Sharpener, belt

2000 EXPERTLY REBUILT—READY TO GO
WRITE TODAY!



THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio
MElrose 1241
CABLE ADDRESS EMCO

IN STOCK

LATHES

8"x108" Fitchburg Lo-Swing
12"x18" Lipe Carbo
18"x6' American Grd. Hd.
20"x10' Lodge & Shipley Grd. Hd.
36"x30' Lodge & Shipley Triple Geared Selective Head, two carriages
42"x18' Putnam Geared Head

MILLING MACHINES

No. 2N Milwaukee Vertical, latest type
#3 Milwaukee Vert. M.D.
#3K Milwaukee Vert.
No. 4 Cincinnati Plain, Motor Drive
No. 4K Milwaukee Plain Late Type
No. 118 Van Norman Production
24" Cincinnati Production
Taylor & Fenn Spline
No. 27MB Smalley General Thread
#2 Hanson-Whitney Thread
No. 6 Lees-Bradner Thread
26"x25"x12' Ingersoll Adjustable Rail
42"x36"x14' Ingersoll Adjustable Rail, four heads

DRILLS

No. 2-8 Spdl. Leland-Gifford
7' American full Universal Radial

VERT. BOR. MILLS

34" King
42" Bullard New Era Vertical Turret
72" Colburn, Motor Drive
72" King, Motor Drive

HOR. BOR. MACHINES

No. 30 Universal, 3" Bar, 60x144" Table, Maximum Bar to Table 72", Maximum Bar to Outboard 120".

GEAR HOBBERS

No. 4 Pfauter, 72" Capacity

PLANERS

36"x36"x8' Woodward & Powell
60"x38"x8' Gray Spiral Geared

TURRET LATHES

No. 2 Brown & Sharpe, Wire Feed
#3 W & S Univ. Bar Feed
#4 W & S Univ. Speed Selector
No. 1-A W & S Univ. Speed Selector
#4—W & S 1½" Screw Machine
#6—W & S 2" Screw Machine
#6R Denver Univ. 2-9/16" capacity
18" Libby—3½" Hole—M.D.

AUTOMATICS

1⅜" Conomatic, 8 Spdl.

GRINDERS

6"x18" Norton Hydraulic Plain
6"x30" Norton Hydraulic Plain
23"x36" Norton Plain, M.D.
14"x168" Norton Plain, Late Type
#22—12" Heald Rotary Surface
10"x24" Landis Universal, M.D.
No. 16 Blanchard Surface, 26" chuck

HILL-CLARKE

MODERNIZED & MOTORIZED CYLINDRICAL GRINDERS

SIZES AVAILABLE

10x18	14x36	16x 50
10x36	14x50	16x 72
10x50	14x72	18x 96
10x72	16-24x50 Gap	24x 96
10x96		24x240

HILL-CLARKE MACHINERY COMPANY

651 Washington Boulevard
Chicago 6, Illinois

LATEST MODELS

No. RD1175J Walker Turner Radials, M.D. (4)
24" Cincinnati Box Col. Upright (1942)
3'11" American "HOLE WIZARD" Radial (1942)
3'11" Morris "MOR-SPEED" Radial (1942)
7'17" Fosdick Radial (1942)
24" Bullard Vert. Turret Lathe, Spiral Drive
36" King Vert. Bor. Mill, Side Head
72" King Vert. Bor. Mill, Side Head (1942)
#340-F Giddings & Lewis Mill (1942)
#2 K & T Rotary Head Die Miller (1943)
No. 1H-12 Kearney & Trecker Mig. Miller (1941)
#4 Cincinnati Pl. Miller (1942)
No. 5H Kearney & Trecker Pl. Miller (1941)
#4 K&T Vert. (1942)
No. 0 Brown & Sharpe Wire Feed (3)
No. 3 Warner & Swasey Univ. Turret, Timken (1941)
No. 4 Warner & Swasey Univ. Turret—1942 (4)
No. 5 Warner & Swasey Univ. Turret—1942
No. 5—2½" Jones & Lamson Univ. Turret —(1942)
No. 1A Warner & Swasey Turret, Timken (3) 1941
No. 2A Warner & Swasey Turret, Timken (2) (1941)
No. 11 Blanchard (2), (1942)
No. 18 Blanchard—(1942)
#10 B & S Cutter & Tool Grdr.
No. 4T Sellers Tool Grinder (never Used)
72A3 Plain Heald Internal Grinder, 3 motor drive for Tool Room—(1942)
4"x12" Landis Type H Plain Grinder, (1942)
14"x168" Norton Type C Plain Grinder, M.D. (1942)
13"x4' & 5' bed South Bend M.D. Lathes (3)
18"x72" Monarch "BB" Lathe raised to swing 24½" (1945)
22"x96" Monarch Model "M" Lathe (1944)
42"x132" Centers American Lathe, M.D. (1942)
50"x17' Centers LeBLOND Lathe, M.D. (1942)

Wigglesworth Machinery Co.

203 Bent St. Cambridge, Mass.

FOR SALE

7 Engine lathes quick change motorized 14", 16" and 20" American
1 Engine late change gear motorized 30" Schumacher & Boye
1 Radial Drill, new 3' Canedy-Otto
1 Logan hand screw machine new
1 4-spindle Camel back drill
1 3-spindle sensitive drill
1 Norton 6"x32" Cylindrical grinder
1 4"x60" Lo Swing Lathe—hardened ways

LIBERTY PLANERS, INC.

HAMILTON, OHIO
Telephone: Hamilton 4400

LOOK THROUGH THIS LIST

AUTOMATICS

¾" & 2" Cleveland Model B
12"x63" & 14"x19" Fay
14"x18" Monarch Magna-Matic
6"x6¾" Goss & DeLeeuw
No. 454 New Britain chucking
Gisholt simplimatic

BORING MILLS

100" Niles Bement Pond heavy pattern
96" Cincinnati Massive Pattern
60" Colburn
53" Niles Bement Pond
42" & 24" Bullard V.T.L.

DRILLS

4' Hammond sensitive radial
18" Walker Turner radial
No. OOS Natco
Garvin duplex
21"x74" Munson double end
4-spdl. #3 Leland Gifford
24" Kokomo upright
24", No. 25 Foote Burt Heavy Duty
34-spdl. #30 Natco

LATHES, TURRET

Nos. 4 & 5 Warner & Swasey universal
Nos. 3-B & 5 Foster universal
Nos. 3 & 5 J. & L. universal
16"x6' South Bend
Nos. 3 & 5 Foster
24" & 42" Bullard vertical
28" Gisholt
3"x36" Jones & Lamson

PRESSES

12 ton U.S. OBI
#10 Bliss straight side
8 & 20 ton General Flexible
35 ton Metalwood straightening
65 ton Watson Stillman straightening
500 ton Southwark hydraulic
1000 ton Lake Erie hydraulic

SHAPERS

16" Gomco (new)
20" American
24" Gould & Eberhardt
32" Morton draw cut

UPSETTERS

1" National
2½" National, latest type with air clutch & guided ram
3" National

MISCELLANEOUS

#10-D Moline cylinder borer
#112-C Ex-Cell-O precision borer
Nos. 1, 2 & 3 Sundstrand balancers
No. 3 Gardner buffer
1400 CU. FT. Sullivan compressor
173 cu. ft. Ingersoll compressor
Nos. 2 & 3 Cincinnati centerless grinders
No. H-1 Micromatic Hydrohoner
#211 Barnes honer
No. 1½ Baker keyseater
No. 9 LeBlond multi-cut lathe
6", 8" and 15" Sundstrand automatic stub lathes
#12-B Pratt & Whitney profiler
Cleveland sand cutter
6", #401 Campbell abrasive saw
Model J Radiac abrasive saw
#11-B Badger alligator shear
4" Stevens die slotter
16" Bement Miles slotter
#2 Garvin tapper
2" #22 Murchey threader
90 KVA Fisher body seam welder

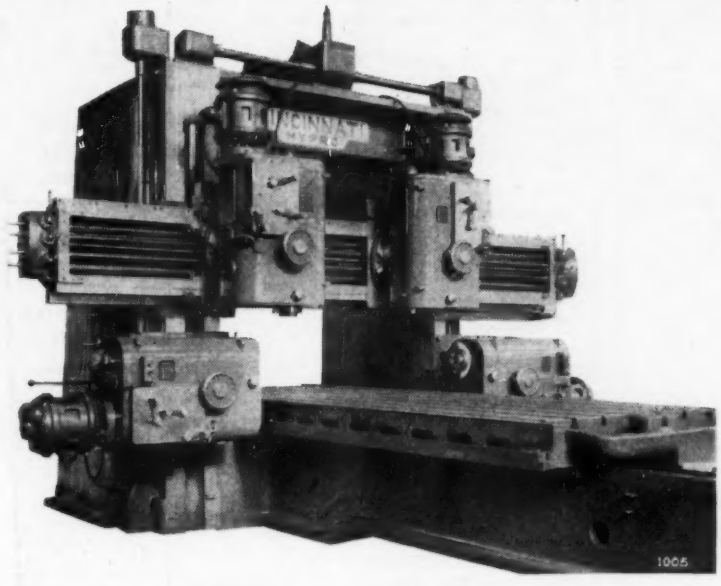
SEND FOR COMPLETE LIST

MILES MACHINERY CO.

SAGINAW, MICH.

BIG TOOLS—LATE TYPE
BEAUTIFUL CONDITION

72" x 46" x 14' CINCINNATI HYPRO PLANER TYPE MILLING MACHINE



Two Heads on Cross Rail and Two Side Heads, 7½" Quills, All Heads arranged for Swivelling, including Cutting Lubricants. Motor Driven with 10 H.P. Motors on Heads, 7½ H.P. Drive Motor, 5 H.P. Rail Motor and ½ H.P. Pump Motor. All Motors and Controls for A.C. Current.

NEW IN 1941

42" x 42" x 16' CINCINNATI HYPRO PLANER —3 HEADS. Motor Driven

36" x 36" x 12' GRAY MAXIMUM SERVICE OPEN SIDE PLANER. Motor Driven

3½" CINCINNATI GILBERT FLOOR TYPE BORING MILL—96" COL. Motor Driven

3½" CINCINNATI GILBERT FLOOR TYPE BORING MILL—60" COL. Motor Driven

No. 340T GIDDINGS & LEWIS HORIZONTAL BORING MILL—Motor Driven

24" and 36" BULLARD VERTICAL TURRET LATHES—Motor Driven

10'-26" COL. CINCINNATI BICKFORD RADIAL DRILL—Motor Driven

60" GLEASON SPIRAL BEVEL GEAR PLANING GENERATOR—Motor Driven

30" x 68" LODGE & SHIPLEY 12 SPEED SELECTIVE GEARED HEAD LATHE—Motor Driven

14" x 60" MODEL A—GALLMEYER & LIVINGSTON HYDRAULIC FEED SURFACE GRINDER—Motor Driven

IMMEDIATE DELIVERY — WIRE TODAY

J. L. LUCAS & SON, Inc.
Bridgeport 5, Conn.

CLOSEOUTS

BORING MILLS
HORIZONTAL

2½" Cleveland, Spd.
2⅝", 4" Binsee

VERTICAL

66", 120" Niles
54" Colburn, M.D., 2 hds.

TURRET LATHES

Foster Nos. 4, 5, 6, 1B, 3B M.D. Univ.
J. & L. 2¼"x24", 3¼"x36".
Acme 3¼" M.D.
No. 1L Gisholt Univ. M.D.

Hilles & Jones Straightening Rolls 6' wide by ½" cap, plate, M.D. with controls, practically new.

GRINDERS

P. & W. 14", 18", B.B., Vert. M.D.
Blanchard 30", M.D.; Modern 12x48" M.D.
Norton Hydraulic 12x18", M.D.
Heald Nos. 72A3 Gagematic
Norton 50"x28', M.D.
Landis Type A 6x20" Hydraulic, M.D.
Bryant No. 12, M.D.
No. 55, 60, 65 Heald Int. Hydraulic, M.D.
12" Heald Rotary, Arter 12" M.D.
B. & S. No. 2 Surface, M.D.
B. & S. No. 10 1 Cyl.
No. 2 Cincinnati Centerless M.D.
B. & S. No. 1, 3 Universal
#25, #55 G. & L. M.D.

LATHES

Monarch geared head
McCabe 26-42"x14'
26x12' Boye & Emmes 3 step cone, B.D.G.
14"x6', 16"x6' Hendey
9" LeBlond Automatic
36x30' Putnam M.D.
36x22" Putnam, D.C. M.D.
32"x35' Wickes
Putnam 42x16', M.D. S.C.G.
P. & W. 1x18, 1¼x18 Automatic Lathes

AUTOMATICS

B. & S. No. 2, Hand Screw
B. & S. No. 0
Cleveland Model A ½", ⅝", 1¼", 2"
Cleveland Model B 1", 2"
P & J 6A, M.D.
⅞" Cone 4 spindle

New In Stock—Power Shears

5, 10, 18 ton OBI Power Presses
7"Ammco Shapers
H.S. Vertical Milling Heads, Drill Presses, Foot Presses
Kalamazoo Metal Band Saws
8" Shap-Rite Shapers

RADIALS

4', 5', 6' American Triple Purpose
4', 5' Cincinnati-Bickford
4' Muller, M.D.; 4' 5' Western, S.P.D.
4' American Hole Wizard, M.D.
4' Fosdick

MILLING MACHINES

Cincinnati, #2 Univ.
No. 3S Cincinnati, S.P.D. rapid trav. M.D.
Nos. 1Y, 0Y, 3, 4, 5 B & S Plain & Univ.
B. & S. Nos. 12, 13, 13B
Hall Planetary Model D Thread Miller
Becker Nos. 3, AB, 5, 6, Vert.
Nos. 3, 4, Cincinnati Vert.
P. & W. No. 12, 30 Profiler, M.D.
K. & T., B. & S., No. 2, 3 like new
B. & S. No. 2, 3, Vert.
No. 8D, Gorton Vertical, M.D.
#3 Van Norman Universal
#2 Conradson Universal
#26 Van Norman Univ.

MISCELLANEOUS

Gorton No. 1S, 3Z Engraving Machine
6 spindle Avey Drill 15" overhang
Rochester No. 5½" B Hammer
6" Vertical Shaper, P & W
Oster Pipe Machines, 4", 6", 8", M.D.
N.B.P. 15" Slotter, M.D.
10x10 Peerless Universal Shaping Saw
#7, 72 Fellows Gear Shapers
Lennox Throatless shear ¼" cap., M.D.

AARON MACHINERY CO., INC.
MONA MEMBER
45 Crosby St.
New York 12, N. Y.

PUNCH PRESSES

IMMEDIATE DELIVERY FROM STOCK

No. 4½ BLISS, 80-100 Ton Capacity straight side punch press, late model with scrap cutters, double roll feeds, bolster. 10 H.P. motors and controls, forced feed lubrication. 21x27 bolster 4½" stroke. In both Single and Double Action Models. Like new.

No. 6 BLISS, 90-125 Ton Capacity, straight side Punch Presses, late model. With scrap cutters, roll double roll feeds, bolster, 15 Hp motors and controls, forced feed lubrication. 25x30" bolster, 5½" stroke. In both Single and Double action models. Like new.

4½—75 ton straight side punch presses adjustable strokes, late model, motorized.

#666 Toledo, Knuckle Joint Press. 1000 ton cap. 37x21 bolster, 2½" dist. bed to slide, good condition, all electrical equipment.

SPOT WELDERS IMMEDIATE DELIVERY 5-300 KVA, Brand new. 5 year guarantee.

PAUL'S MOTOR AND MACHINERY SUPPLY CO.
MONA MEMBER
Detroit 8, Mich.
6111 Vermont Ave.
TYLER 76300

1" Ajax Upsetting & Heading Machine, AC motor, air clutch
1¼" Pawtucket Upsetting and Heading Machine DC motor
1" Waterbury Farrell Bolt Trimmer, AC motor
¾" Landis Automatic Forming and Threading Mch. AC motor
1" Pawtucket Punch, DC motor
1½" (#1), Pawtucket Shears (Improved Bar) AC motor
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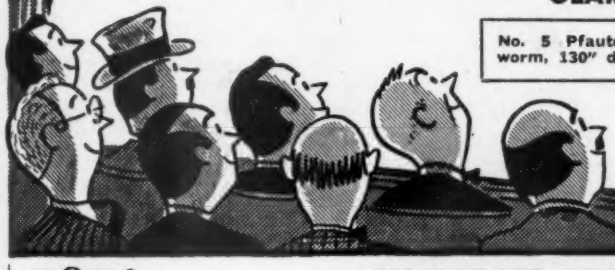

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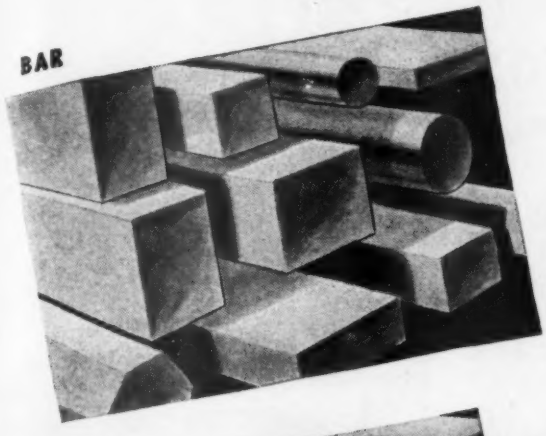

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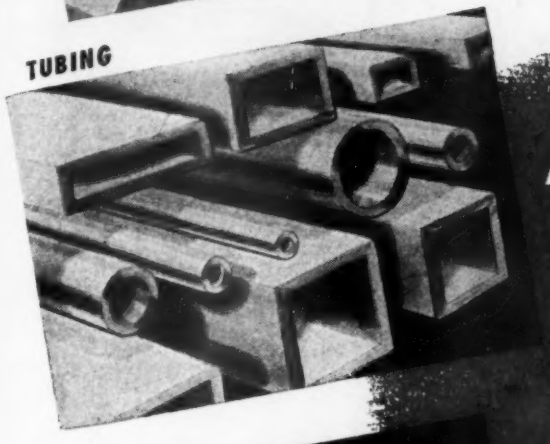

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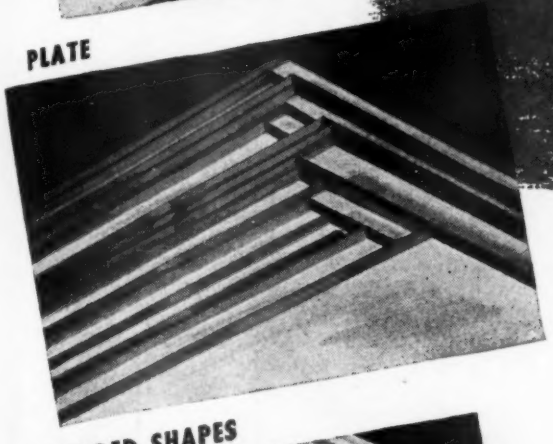

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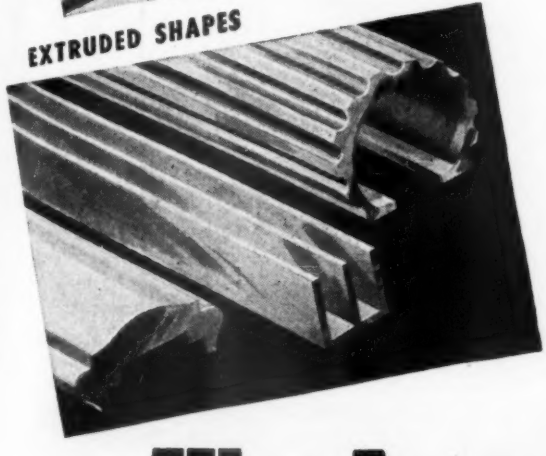

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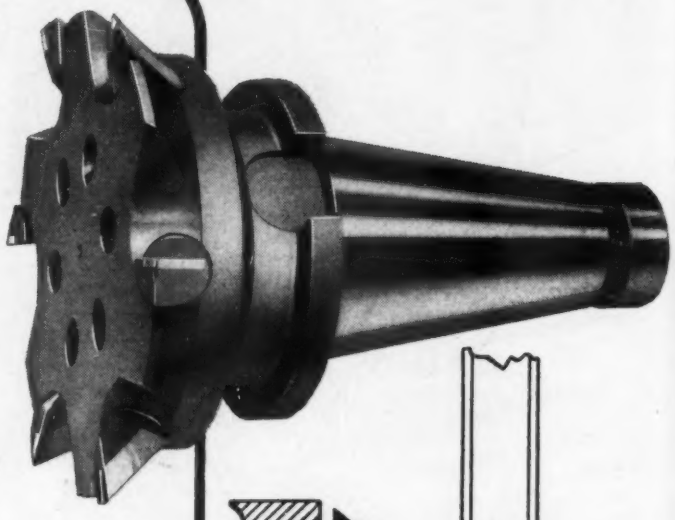
DOVETAIL CUTTER



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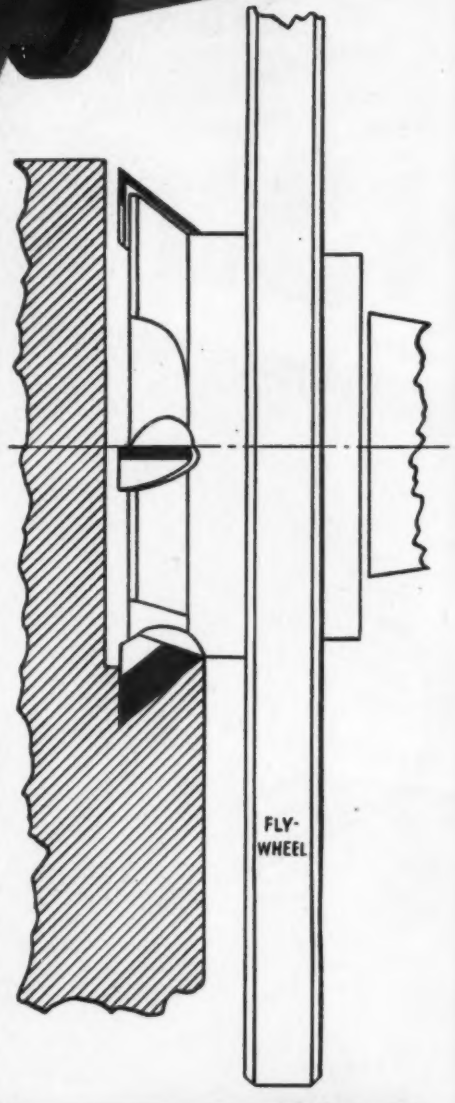

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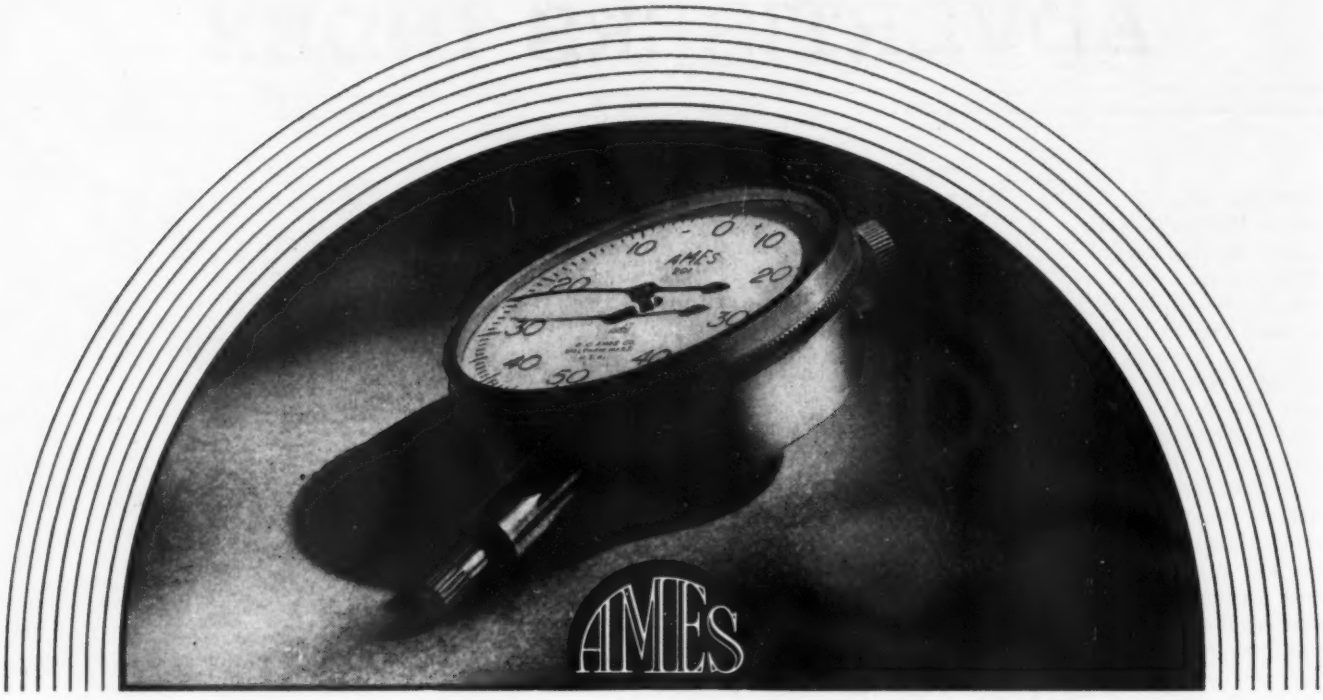

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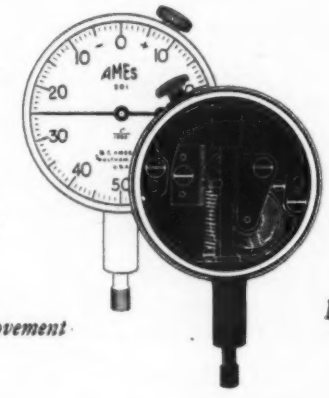

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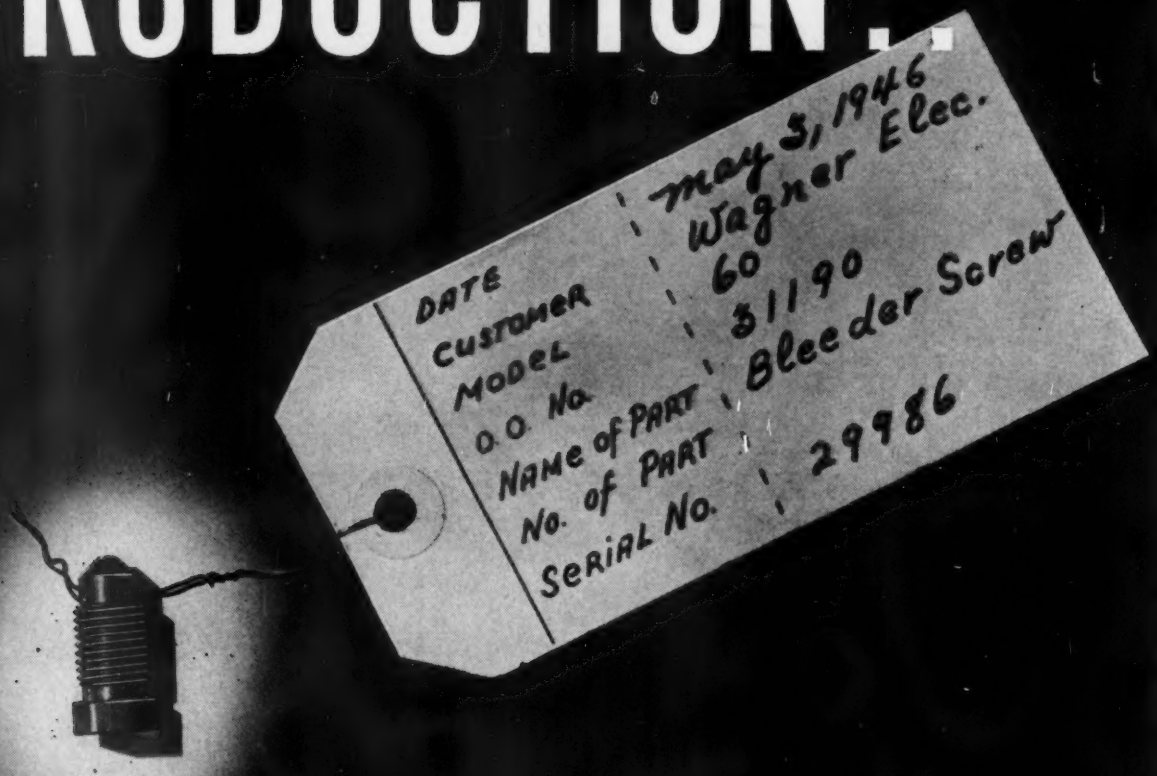

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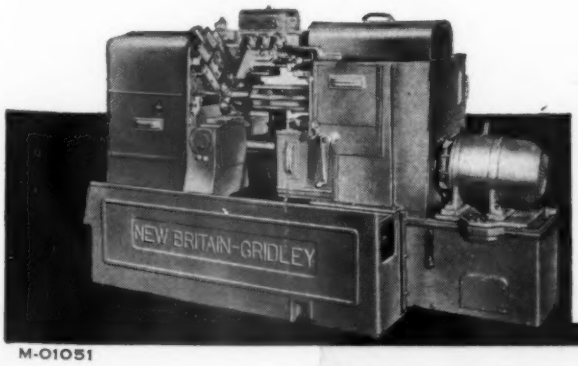

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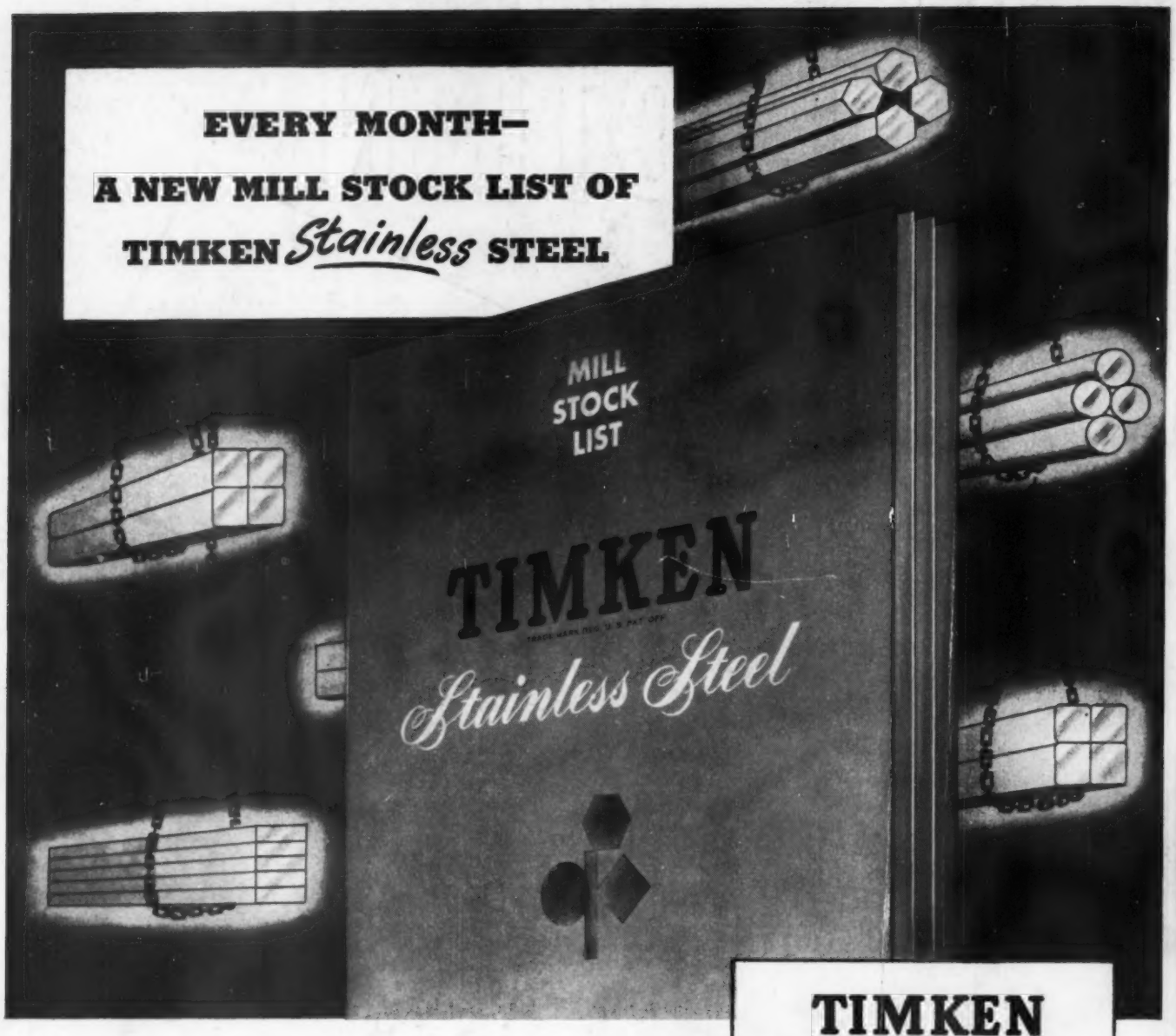

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